A DISSERTATION ON

"A COMPARATIVE STUDY ON THE EFFECTIVENESS OF ERAS PROTOCOL (ENHANCED RECOVERY AFTER SURGERY) PATHWAY WITH CONVENTIONAL PROTOCOL IN GASTROINTESTINAL SURGERIES"

Dissertation submitted to

THE TAMILNADU Dr.M.G.R MEDICAL UNIVERSITY CHENNAI

With partial fulfillment of the regulations
for the award of the degree

M.S.[General Surgery]

Branch - I

DEPARTMENT OF GENERAL SURGERY,

STANLEY MEDICAL COLLEGE,

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MAY - 2018

CERTIFICATE

This is to certify that the dissertation entitled **"A COMPARATIVE STUDY ON THE EFFECTIVENESS OF ERAS PROTOCOL (ENHANCED RECOVERY AFTER SURGERY) PATHWAY WITH CONVENTIONAL PROTOCOL IN GASTROINTESTINAL SURGERIES"**

is a bonafide original work of **Dr.HEMILDA PERIYANAYAKI.J**, in partial fulfillment of the requirements for M.S.Branch–I (General Surgery) Examination of the Tamil Nadu Dr. M.G.R. Medical University to be held in APRIL 2018 under my guidance and supervision in 2017-18.

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DECLARATION

I, **Dr. J.HEMILDA PERIYANAYAKI** solemnly declare that dissertation titled, "**A COMPARATIVE STUDY ON THE EFFECTIVENESS OF ERAS PROTOCOL (ENHANCED RECOVERY AFTER SURGERY) PATHWAY WITH CONVENTIONAL PROTOCOL IN GASTROINTESTINAL SURGERIES**"
is a bonafide work done by me at Govt. Stanley Medical College & Hospital during 2015-2018 under the guidance and supervision of my Unit Chief. **Prof.Dr.G.UTHIRA KUMAR M.S.** Professor of Surgery. The dissertation is submitted to Tamil Nadu Dr. M.G.R. Medical University, towards partial fulfillment of requirement for the award of M.S. Degree (Branch – I) in General Surgery, Examination to be held on April 2018.

Place : Chennai.

Date :

(Dr.J. HEMILDA PERIYANAYAKI)

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I am extremely thankful to all the Members of the INSTITUTIONAL ETHICAL COMMITTEE for giving approval for my study. I also thank all the patients who were part of the study and my Professional colleagues for their support and criticisms.

(**Dr.J.HEMILDA PERIYANAYAKI**)

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INSTITUTIONAL ETHICAL COMMITTEE, STANLEY MEDICAL COLLEGE, CHENNAI-1

Title of the Work : A Comparative study on effectiveness of ERAS protocol (Enhanced recovery after Surgery) pathway with conventional protocol.

Principal Investigator : Dr. J Hemilda Periyanayaki

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The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 02.12.2016 at the Council Hall, Stanley Medical College, Chennai-1 at 2PM

The members of the Committee, the secretary and the Chairman are pleased to approve the proposed work mentioned above, submitted by the principal investigator.

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INTRODUCTION:

"Enhanced Recovery after Surgery"(ERAS) was known as "fast track" surgery or "enhanced recovery protocol" (ERP).

In the previous decades, there has been a tendency to aim for a shorter hospital stay following several surgical procedures, including Gastro intestinal surgery. There are many reasons for this: firstly, increasing knowledge. Secondly, the aim to reduce hospital stay based on economic efficiency.

Enhanced recovery is a new way of improving the experience of patients who need major surgery. It helps patients recover sooner so life can return to normal as quickly as possible. It refers to patient-centered, evidence-based and interdisciplinary team developed pathways for a surgical specialty and facility culture to reduce the patient's surgical stress response, optimize their physiologic function and facilitate recovery.

(ERAS) protocols comprise a combination of various perioperative patient care methods using a multidisciplinary team approach that

integrates evidence based interventions that reduce surgical stress, maintain postoperative physiological function and accelerate recovery in patients undergoing major surgery. ERAS protocols involve pre, intra and postoperative elements and their fundamental aspects focus on the preoperative counseling, no fasting, optimal fluid management, decreased use of tubes, opioid-sparing analgesia and early mobilization.

More than 234 million major surgical procedures are performed globally each year and despite advances in surgical and anesthetic care, morbidity after abdominal surgery is still high. The Fast-track or enhanced recovery after surgery (ERAS) clinical pathways have been proposed to improve the quality of perioperative care with the aim of attenuating the loss of functional capacity and accelerating the recovery process. The ERAS pathways reduce the delay until full recovery after major abdominal surgery by attenuating surgical stress and maintaining postoperative physiological functions. The implementation of the ERAS pathways has been shown to impact positively in reducing postoperative morbidity and as a consequence length of stay in hospital (LOSH) and its related costs are reduced.

Use of the ERAS pathway has been shown to reduce care time by more than 30 percent and to reduce postoperative complications by up to 50

percent. ERAS pathways have been implemented successfully in specialties like pancreatic, gynecologic, cardiovascular, thoracic, pediatric, orthopedic, colorectal surgery and urologic surgery. To this end, this study aimed to evaluate the efficacy and safety of ERAS protocols for patients with Gastro intestinal surgery.

ERAS is a multimodal peri-operative care pathway designed to achieve early recovery for patients undergoing major surgery.

ERAS at first re-examines traditional practices, replacing them with evidence based best practices when necessary. Second, it is comprehensive in its scope, covering all areas of the patient"s journey through the surgical process.

The key factors that keep patients in the hospital after surgery include the need for parenteral analgesia, the need for intravenous fluids secondary to gut dysfunction, bed rest caused by lack of mobility.

The central elements of the ERAS pathway address these key factors, helping to clarify how they interact to affect patient recovery. In addition, the ERAS pathway provides guidance to all involved in peri-operative

care, helping them to work as a well-coordinated team to provide the best care.

Reduce care time by more than 30%:

A recent study shows that ERAS programs allow patients to recover much faster after their operation and this reduces the need for hospital stay by about 30% or more than 2 days after major abdominal surgery. Despite earlier discharge from the hospital, re admissions did not increase.

Reduce complications by up to 50%:

ERAS reduce major complications after abdominal surgery by as much as 40%. In particular non-cardiac complications, such as those from the lungs and cardiovascular systems are markedly reduced.

Although each components are effective in their own way, all components should be put together to achieve maximum benefit. With eras protocol, the length of hospital stay can be reduced to 2 to 4 days. This reduced of length of hospital stay is achieved after all discharge

criterias have been meet. Thus eras is advantageous in fulfilling complete recovery of the patient compared to the conventional methods with least length of hospital stay.The basic mechanism of eras is reducing the stress response of organs to surgery which is evident by the early return of gut function.

AIMS AND OBJECTIVES:

To study the effectiveness of "Enhanced Recovery After Surgery"(ERAS) protocol compared with the conventional way of management of patients undergoing gastrointestinal surgeries.

REVIEW OF LITERATURE:

HISTORY:

The concept of enhanced recovery after surgery was initially proposed by Professor Henrik Kehlet who explored the possible determinants of post-operative morbidity in the late 1990s.Kehlet identified potential risk factors that needed to be recognized and treated peri-operatively to minimize the effects of surgical stress on the patient. He championed the idea of working with a multidisciplinary framework. Together this has led to a series of interventions which has been formulated into standardized protocols to span a patient entire journey through the surgical process with distinct elements in the pre-operative, intra-operative and post-operative phase.

Colorectal surgery was the first specialty to implement ERAS in the early 2000s. These studies proved feasibility and demonstrated that patients benefitted from shorter length of hospital stay and reduced post-operative ileus and cardio pulmonary complications compared with standard care. Enhanced Recovery After Surgery has also been feasible and safe in the emergency colorectal setting, leading to shorter length of stay and faster recovery of bowel function.

Further ERAS implementation:

2002 - Colonic, rectal and Pancreatic surgery.

2003 - Cystectomy surgery

2004 - Gastric resection surgery

2006 - Anesthesia protocols, pathophysiology and Major gynecology surgery

2007 - Bariatric, Liver resection and Head & neck cancer surgery

Upcoming - Esophageal resection and Thoracic non cardiac surgery.

Professor Kehlet's worked at several different European centers and the adoption of these ERAS principles is fast growing across US and all other countries including India.

SUMMARY

The surgical management and surgical care of patients are undergoing a drastic shift.

Conventional ways of peri-operative surgical care like prolonged fasting, mechanical bowel preparation, keeping patients NPO with nasogastric tubes for many number of days till there is obvious recovery from paralytic ileus with bowel movements have been stopped. These drastic changes involving pre-operatively, intra-operatively and post-operatively have been formulated into ERAS protocols.

COMPONENTS OF ERAS

Pre-operative recommendations:

1. Counselling and information of the patient and the attenders”
2. Lesser period of fasting
3. carbohydrate loading.”
4. “Avoidance of bowel preparations.”
5. “DVT prophylaxis.”
6. “Antibiotic prophylaxis.”

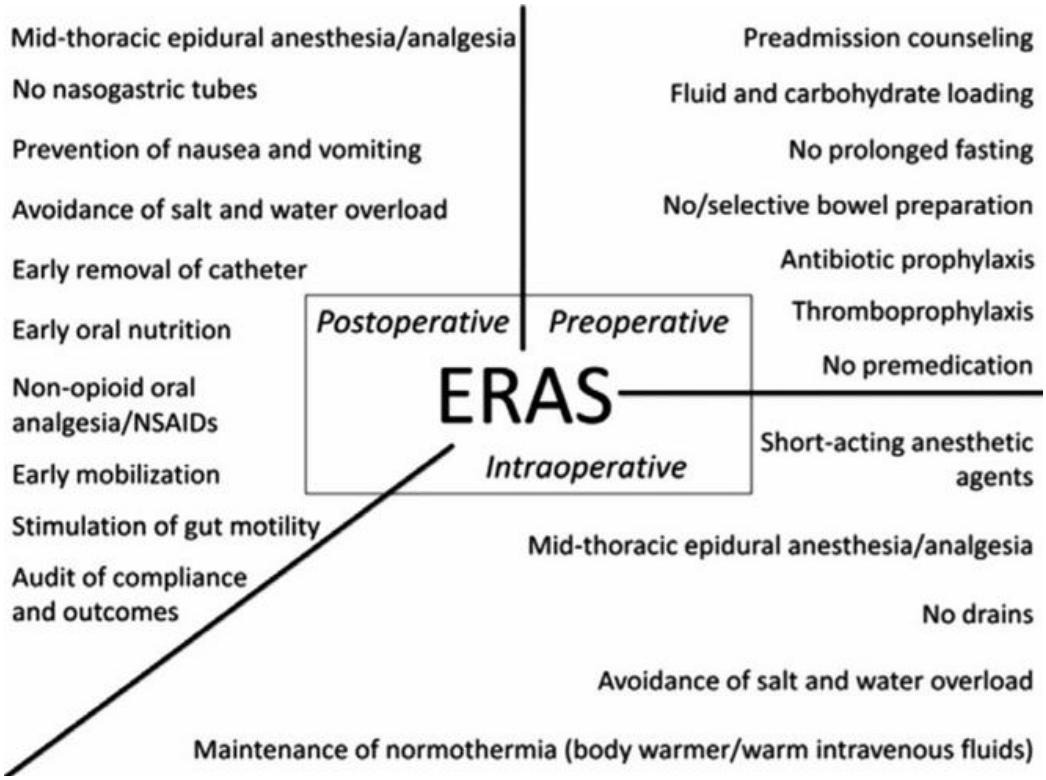
Peri-operative recommendations:

1. “High O2 concentration peri-operatively”
2. “Hypothermia prevention.”
3. “Goal directed fluid therapy.”
4. “Use of shorter and transverse incisions .”
5. “Avoidance of DT and NG tubes.”
6. “Use of epidural analgesia and local blocks.”

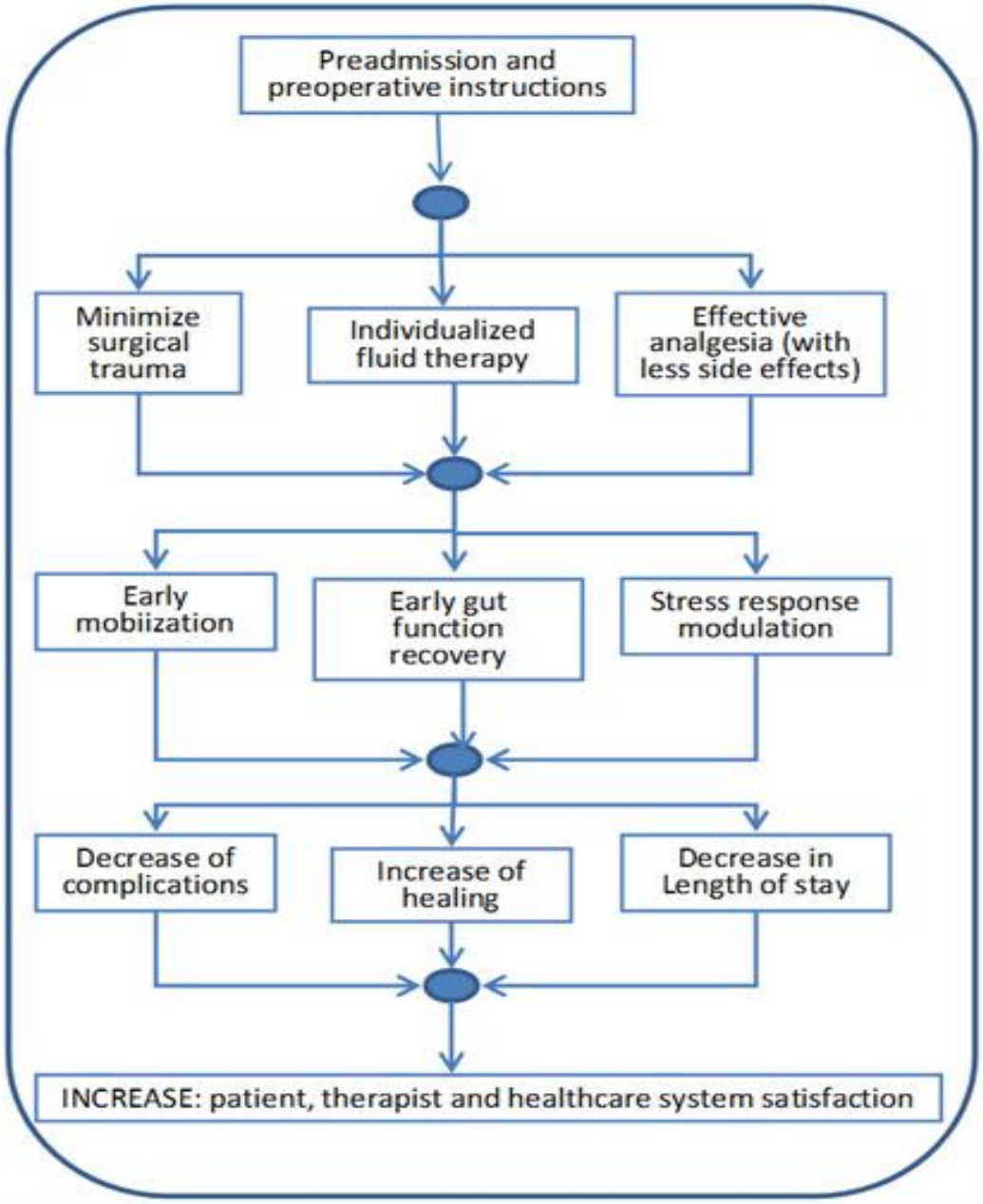
Post-operative recommendations:

1. "Avoidance of opiates"
2. "Early enteral feeding."
3. "Early mobilization."
4. "Restricted amounts of IV fluids."
5. Audit."

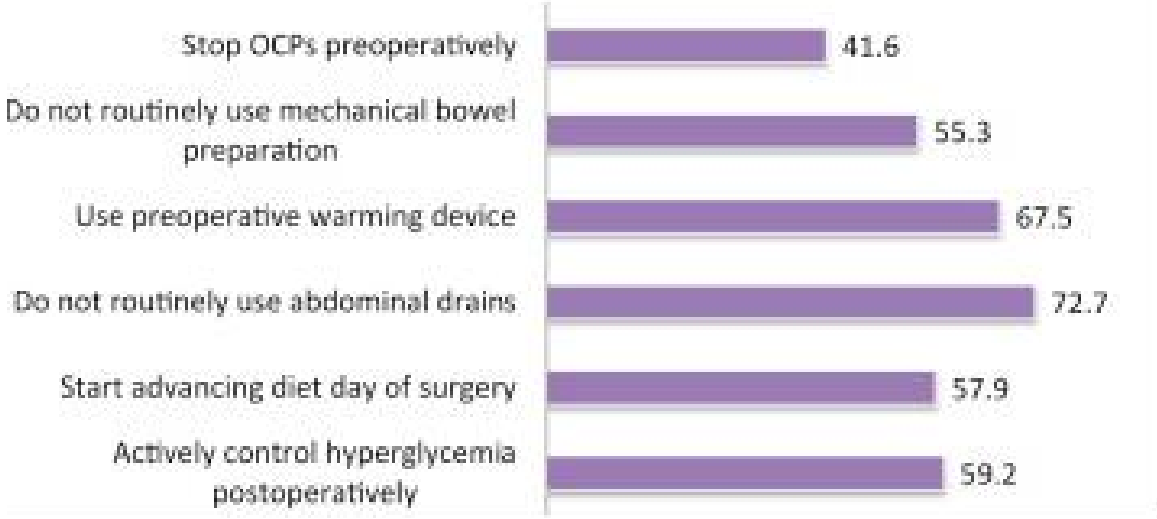
Function of ERAS with its types:



Pre-operative interventions	Operative interventions	Post-operative interventions
¨ Evaluation and optimization of existing organ function ¨ Ensuring good nutritional status ¨ Improving physical fitness ¨ Patient education ¨ Minimal starvation ¨ Oral Carbohydrate drink ¨ No mechanical bowel preparation	¨ Pre-operative Antibiotic, acid suppression and pro-kinetic ¨ Thoracic epidural analgesia ¨ Elective use of nasogastric decompression, urinary catheterization and abdominal drainage ¨ Goal directed fluid therapy ¨ Maintaining Normothermia ¨ Minimal tissue handling ¨ Minimize operative time ¨ Minimal access surgery	¨ Pre-emptive and adequate analgesia ¨ Post-operative nausea and vomiting prophylaxis ¨ Early removal of all drains and tubes if inserted ¨ Early enteral nutrition ¨ Early enforced ambulation ¨ Ensure follow-up after discharge


Preadmission and preoperative instructions
Minimize surgical trauma
Individualized fluid therapy
Effective analgesia (with less side effects)
Early mobiization
Early gut function recovery
Stress response modulation
Decrease of complications
Increase of healing
Decrease in Length of stay
INCREASE: patient, therapist and healthcare system satisfaction

Current strong ERAS recommendations/strong evidence: 25 -75% compliance



Results: Adherence Rates

Pre-operative Counseling	**71.9%**
Preoperative Anesthesia Consult	94.8%
CHO loading preop	74.1%
Timely antibiotics	85.6%
Normothermia	94.8%
Adequate PONV prophylaxis	86.6%
Goal directed fluid therapy with monitor	54.7%
Multimodal analgesia	74.1%
Fluids on POD 0	61.8%
Mobilization POD 0	40.8%
Mobilization POD 1 X2	71.0%
Solids on POD 1 or 2	33.2%

Period	Enhanced Recovery Protocol (ERP)	Conventional care Protocol (CCP) (key differences only)
Pre-operative	• Provide complete information about the protocol and take an informed consent Advice given regarding exercise, smoking and alcohol cessation • Optimize any pre-existing co-morbidity Minimal starvation (6 hrs for solids and 2 hrs for liquids) • 100g oral carbohydrate drink • Avoid mechanical bowel preparation • Pre-operative antibiotic	• Overnight starvation • No carbohydrate drink • Mechanical bowel preparation • Parenteral hydration (to compensate for bowel preparation)
Operative	• Epidural anaesthesia (0.125% bupivacaine, continuous infusion) along with spinal or general anaesthesia • Arterial/Central lines inserted only if unavoidable • Goal directed fluid therapy • Maintain optimal oxygenation • Avoid hypothermia • Minimal tissue handling • Elective use of nasogastric tubes, abdominal drains and urinary catheters	• Done under spinal or general anaesthesia • Routine use of Nasogastric tubes, abdominal drain and urinary catheter • Liberal hydration
Post-operative	• Maintain supplemental oxygen • Strict post-operative nausea and vomiting prophylaxis • Early enforced mobilization • Early enteral nutrition • Removal of epidural catheter by day 2 • Ensuring adequate analgesia after epidural catheter removal • Early removal of all tubes, drains and catheters	• No emphasis on PONV prophylaxis • No enforced mobilization • Removal of nasogastric tube and abdominal drain delayed till markers of bowel motility are observed Oral or Enteral nutrition given once bowel motility is restored
Post-discharge	• Ensure 30-day follow-up including: ○ Phone call at 48 hours ○ 7th day Clinic visit ○ Any Emergency visit	• Patient follows up on day 7 in the clinic or else as and when required

“PRE-OPERATIVE COMPONENTS”

1) Detailed information and counseling

Patient and the attenders should be given complete information about the disease and they have to be explained in detail about the procedure that were planned for the patient. They can be educated using verbal or in a diagramatic format. They should also be made known about the every complications that may occur. Every patient who have been planned for surgery should be counseled .This counseling and educative program of the patient and the attenders need a dedicated special team. The team members may be directly related to the patient in view of performing the surgery and the team should also include other health care workers like counselors, physical medical rehabilitation therapists, stoma care nurses, nutritionist and anaesthetists and all other personals who will handle the patients till their discharge. The information can be produced in a verbal or written form for their easy understanding. The information must include these:

a. “The core components of eras and its benefits.”

b. “”What does the patient should expect during the course of the hospital stay.

c. “Various issues which may delay discharge (like lack of social support).”

d. “Clear instructions must be given regarding early mobilization, early enteral feeding and breathing exercises. Active participation of the patients themselves in their recovery should be sought .
e. “Patients who may require stoma should be trained appropriately such that they are efficient at stoma care, even before surgery.”

This pre-operative counseling has improved patients satisfaction and outcome.

2) Reduced Fasting and carbohydrate loading:

Patients should in fasting for solid diet for about 6 hours before anaesthesia and they are allowed to take clear fluids for upto two hours before general anaesthesia.

- Patients should be allowed to eat solid foods until 12 midnight and clear liquids until 2 to 3 hours before surgery
- Patients should be given a suitable drink rich in carbohydrate, up to 800 mL at bedtime the night before surgery and 400 mL on the day of surgey for upto 2 hours before anaesthesia.

Overnight fasting with NPO of 8 hours before surgery was the conventional way of preparation of patient before surgery. This has been followed to reduce the stomach contents , thereby preventing regurgitation, vomiting and aspiration. But, short periof of fasting with allowance of clear fluid for upto 2 hours before surgery have been seen beneficial as this has shown to improve the patients well being. Carbohydrate loading of the patient along with a short fast has shown to

maintain nitrogen balance and reduces insulin resistance post-opeartively. The drink used for carbohydrate loading should be clear and residue free.

Diabetic Patients

Carbohydrate loading has been shown to be safe in diabetic patients who are non insulin dependent diabetic patients. Studies have shown that this carbohydrate loading does not cause hyperglycemia or delayed gastric emptying. Glucose levels must be monitored at regular intervals.

3) Avoidance of bowel preparation:

Traditionally patients were prepared for gastro-intestinal surgeries with oral mechanical bowel preparation. This was done in view of reducing sepsis even if there occurred a anastamotic leak. Now many studies have shown and proved that avoidance of mechanical bowel preparation does not reduce sepsis even if an anastomotic leak has occurred.

Patients having an open or laparoscopic low anterior resection (LAR) with or without a diverting stoma should take a MBP, should not have any dietary restrictions prior to taking the MBP and then afterwards should stay on clear liquids and should take a Fleet enema.

Open or laparoscopic colorectal procedure for patients having except LAR ± diverting stoma (but including segmental resections, APR, TPC, IPAA, etc) do not require MBP, should have no dietary restrictions and should have a Fleet enema if they are having a left sided anastomosis.

The mechanical bowel preparation can cause serious complications like fluid imbalance, specifically the elderly.

Mechanical Bowel Preparation

Source	Anast. Leak (%)			Wound infection (%)			Abd. pelvic sepsis (%)			Mortality (%)		
	MBP	No BP	P	MBP	No BP	P	MBP	No BP	P	MBP	No BP	P
Güenaga	Rectum 8.8	10.3	> 0.05									
	Colon 3.0	3.5	> 0.05									
	Overall 4.4	4.5	> 0.05	9.6	8.5	> 0.05	2.0	3.0	> 0.05	1.6	1.8	> 0.05
Slim K	Overall 4.02	3.44	> 0.05	9.5	8.3	> 0.05	1.9	2.5	> 0.05	1.8	1.9	> 0.05
P. Wille-Jørgensen	Rectum 9.8	7.5	> 0.05									
	Colon 2.9	1.6	> 0.05									
	Overall 6	3.2	= 0.003	7.4	5.4	=0.07				1.0	0.6	>0.05

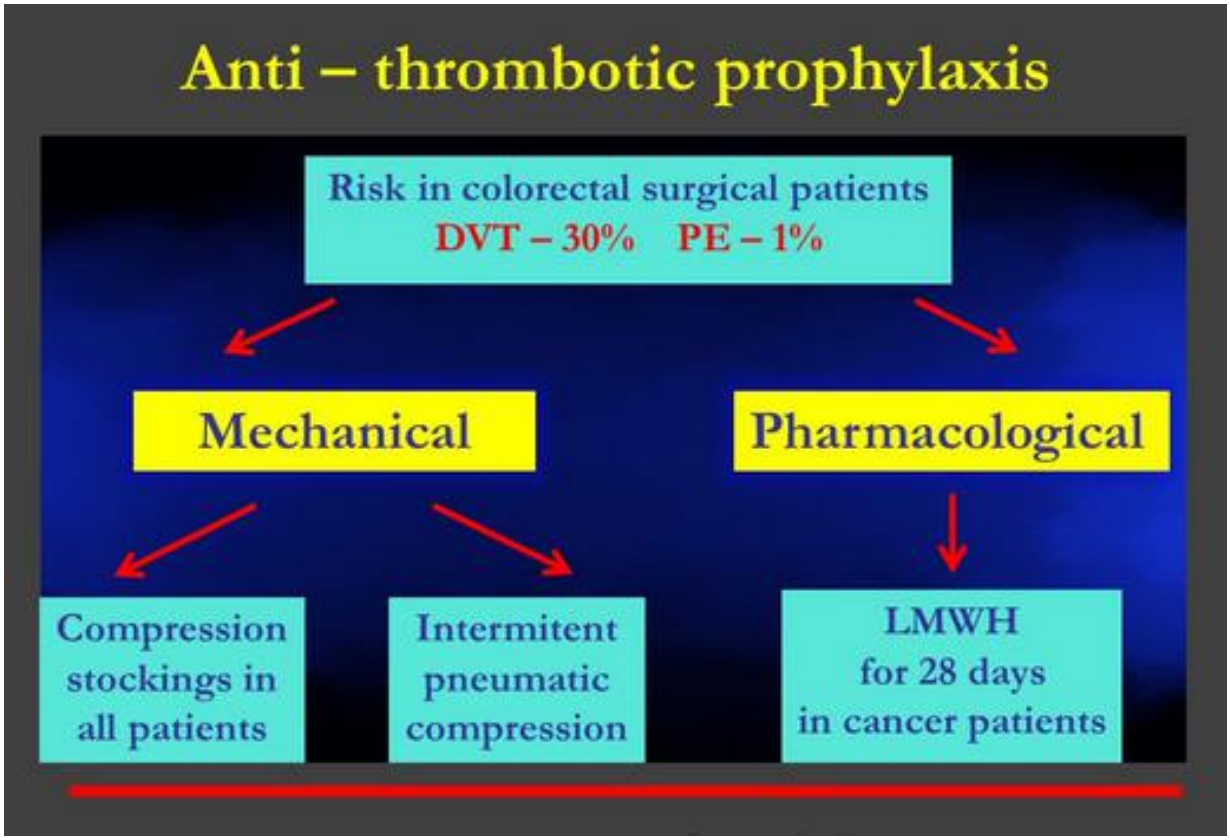
4.DVT prophylaxis:

Patients undergoing surgeries should be categorized into low, moderate or high risk groups based on the risk factors for thromboembolism. Patients coming under low risk, Graduated compression stockings can be used. Intra-operatively , pneumatic compression device can be used.

Patients coming under moderate and high risk group for thromboembolism should be started on low molecular weight heparin(enoxaparin 20mg , sc) the night before surgery and continued till he discharge of the patient. Patients at higher risk of thromboembolic complications like residual malignancy or previous history of thrombosis, hyper coagulable state patients should continue heparin for upto one month after surgery.

Low molecular weight heparin has been recommended as single daily dose for deep vein thrombosis prophylaxis because it is easy to administer and has very few bleeding complications and other complications when compared to unfractionated heparin.

LMWH can be combined with graduated compression stockings for effective DVT prophylaxis.



5) Antibiotic prophylaxis

A prophylactic dose of antibiotic should be given to all patients before incising the skin. The choice of antibiotic should cover both aerobic and anaerobic organisms. For procedures more than 4 hours or if there more blood loss >1500ml, a second dose of antibiotic should be administered.

Antibiotic prophylaxis has shown to be very effective in reducing the wound infectious rate

The Antibiotic Surgical Care Improvement Project (SCIP) measures include the following:

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Antibiotic Prophylaxis:

1. Antibiotic received within one hour prior to surgical incision,
2. Antibiotic selection for surgical patients, and
3. Antibiotics discontinued within 24 hours after surgery end time. (48 hrs for cardiac surgery)

Type of Surgery	Antimicrobial Recommendations
Cardiac or Vascular	Preferred: Cefazolin 1-2 gm IV. If B-lactam allergy: Clindamycin 600-900 mg IV or Vancomycin 1 g IV. If known history of MRSA: Vancomycin 1 g IV
Colon	Preferred: Cefoxitin 1-2 g IV, or Ertapenem 1 g IV. If ß-Lactam Allergy: Metronidazole 500 mg IV and Ciprofloxacin 400 mg IV
General Surgery (gastroduodenal, hepatobiliary)	Preferred: Cefoxitin 1-2 g IV. If ß-Lactam Allergy: Metronidazole 500 mg IV and Ciprofloxacin 400 mg IV
Other General Surgical Procedures (e.g. hernia repair, breast)	Preferred: Cefazolin 1-2 g IV. If ß-Lactam Allergy: Clindamycin 600-900 mg IV or Vancomycin 1 g IV. If known history of MRSA: Vancomycin 1 g IV
Gynecological Procedures (e.g. hysterectomy, C-section)	Preferred: Cefoxitin 1-2 g IV. If B-lactam allergy: Metronidazole 500 mg IV and Gentamicin 1.5mg/kg IV or Metronidazole 500 mg IV and Ciprofloxacin 400 mg IV
Neurosurgery	Preferred: Cefazolin 1-2 gm IV. If ß-Lactam Allergy: Clindamycin 600-900 mg IV or Vancomycin 1 g IV. If known history of MRSA: Vancomycin 1 g IV
Orthopedic: Hip/Knee Arthroplasty (infuse completely before tourniquet inflation)	Preferred: Cefazolin 1-2 gm IV. If ß-lactam allergy: Clindamycin 600-900 mg IV or Vancomycin 1 g IV. If known history of MRSA: Vancomycin 1 g IV

Multiple doses increases risk of infections like Clostridium difficile. Therefore single dose is beneficial and could be repeated on certain circumstances.

OPTIMISATION OF CO-MORBIDITIES

Smoking:

Smokers often have comorbidities due to smoking such as chronic obstructive airways disease, emphysema, peripheral vascular and ischaemic heart disease and cerebrovascular disease that can increase the risk of perioperative complications independently. Smokers without these comorbidities still have an increased perioperative risk, mainly due to poor wound and tissue healing which can lead to wound infection as well as cardiopulmonary complications such as chest infection.

Studies have been undertaken to assess whether shortterm abstinence from smoking can improve outcome. The cessation of smoking for 4 weeks prior to surgery has been shown to improve wound healing. The use of nicotine replacement therapy (NRT) and counselling facilitate preoperative smoking cessation.

Other pharmacological interventions are also available. Varenicline, in combination with two preoperative 15-minute standardized counselling sessions, started 1 week before surgery and followed up for 12 weeks, was shown to improve long-term smoking abstinence (RR 1.45, 95% CI 1.01–2.07, P = 0.04) but not reduce postoperative complications in comparison with placebo. However, nausea occurred more frequently in patients treated with varenicline (13.3% vs. 3.7%, P = 0.004). Antidepressants such as bupropion also seem beneficial to improve smoking cessation, but limited data are available in the perioperative setting.

Recommendation - Cessation of smoking and alcohol intake at least 4 weeks before surgery is recommended. Encouraging patients is not enough; pharmacological support and individual counselling should be offered to every patient who smokes and to alcohol abusers undergoing elective surgery.

Optimization of medical conditions, such as cardiovascular diseases, anaemia, chronic obstructive airways disease, diabetes, nutritional status and frailty and should follow international recommendations.

Glycaemic control (Preoperative):

Blood glucose levels increase during and after elective surgery with the magnitude of hyperglycaemia depending upon the patient's metabolic state (fasting, fed, diabetes), the type of anaesthesia and analgesia and the severity of surgical tissue trauma.

Strong evidence indicates that even moderate increases in blood glucose are associated with adverse outcomes. Patients with fasting glucose levels > 7 mmol/l or random blood glucose levels > 11.1 mmol/l on general surgical wards showed an 18-fold increased in-hospital mortality.

More recent observations suggest that the quality of preoperative glycaemic control also is important. In fact elevated HbA1c levels have been found to be predictive of complications after cardiac and abdominal surgery.

Mere associations between two variables, i.e. glycaemia and clinical outcomes, do not prove a direct cause–effect relationship. At present there is insufficient evidence to demonstrate superiority of strict glycaemic control (blood glucose levels within a normal and

narrow range) over conventional management in surgical patients. As in the ICU situation, it remains a balance between the benefits of bringing down glucose levels vs. the risks of hypoglycaemia. For the surgical patient on the ward, there is also the issue of the nursing staffing and their capacity to monitor patients on intensive insulin treatment to take into account.

A review of the effect of glycaemic control on the incidence of surgical site infections was inconclusive, mainly because of the small number of studies (n = 5), the heterogeneity in patient populations, the route of insulin administrations, the definition of outcomes measures and the fact that glycaemic targets were different and/or were not achieved. Hence, to date, the optimal glucose level for enhancing clinical outcomes is unknown.

Hence, Glucose concentrations should be kept as close to normal as possible without compromising safety. Employing perioperative treatments that reduce insulin resistance without causing hypoglycaemia is recommended.

Haemodynamic management Preoperative period:

Preoperative hydration deficit can vary according to patients' comorbidities, preoperative fasting and use of preoperative mechanical bowel preparation (MBP). The avoidance of prolonged preoperative fasting, MBP and as well the administration of preoperative carbohydrate (CHO) drinks have substantially reduced intraoperative fluid requirements.

However, when MBP is indicated fluid and electrolytes derangements occur even if patients are encouraged to drink. The replacement of preoperative intravascular deficits should be based on individualized intraoperative fluid administration strategies rather than administering fluid based on anecdotal "textbook recipes".

INTRA-OPERATIVE COMPONENTS

1) Use of epidural analgesia and blocks:

Patients undergoing gastro-intestinal surgeries should receive epidural analgesia before induction of general anaesthesia. Analgesics can be administered through the epidural catheter for 48 hours. Make sure the equipment does not interfere with patient's mobilization.

The epidural catheter is placed in the epidural space at the level of T9 and T10 and a local anaesthetic solution (Bupivacaine 0.15%) is administered. This causes a blockade of the spinal nerves.

Epidural analgesia has shown to be effective in reducing post operative surgical stress response and improving gut function by blocking the sympathetic activityBut this blockage of sympathetic activity may cause hypotension which is not responsive to IV fluids. In those circumstances of non responsive hypotension, patient should be shifted to ICU care and should be started on vasopressors or ionotrophes.

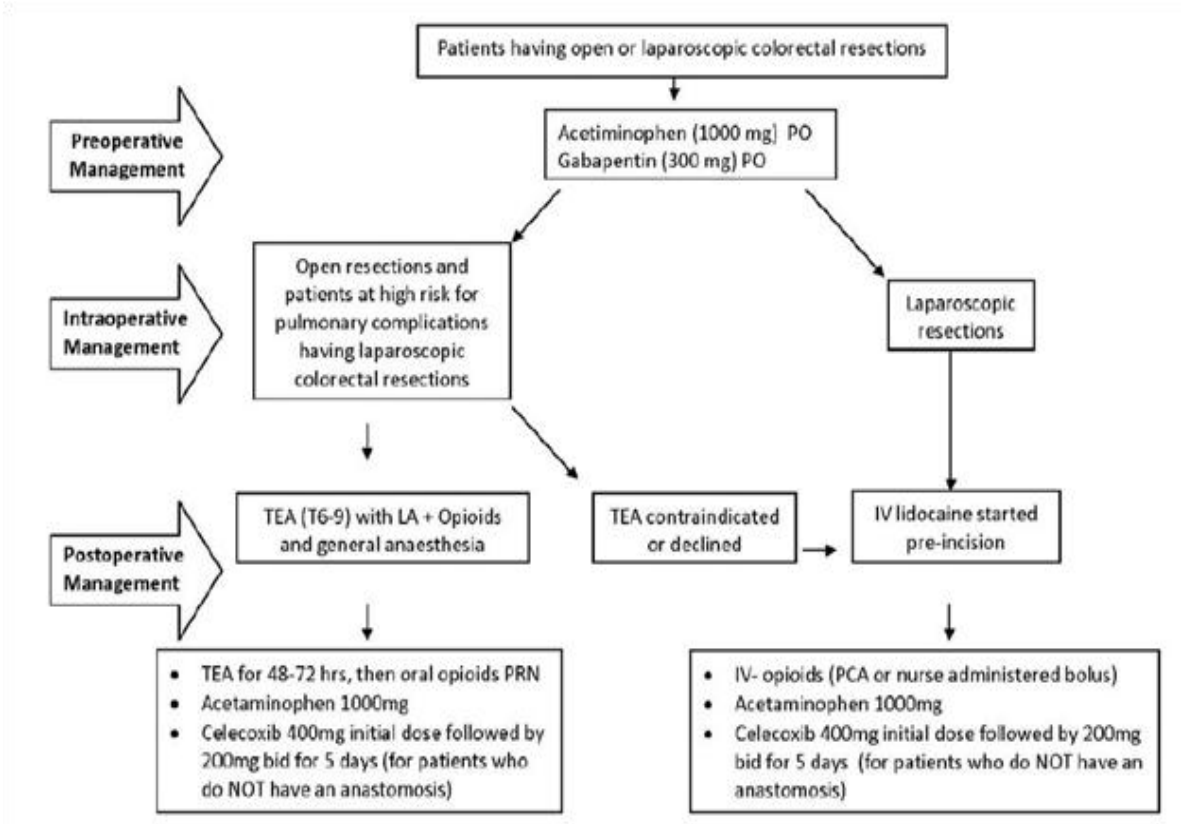
Other modalities like transverse abdominis blocks could be used instead of epidural analgesia with local infiltration of analgesics .

Analgesic requirements after laparoscopic surgery are lower and, as such, epidurals may not have an added advantage and, on the other hand, only increase the risk of epidural related complications. However, this should not preclude the surgeon or the anaesthetist to use epidural analgesia for laparoscopic surgery if they deem it to be safe and useful in their local setting.

Abdominal trunk blocks:

Transversus abdominis plane (TAP) block and rectus sheath block. Significant reduction of pain intensity and opioid consumption after ultrasound-guided single-shot TAP blocks has been observed but it is limited to the first 24 h after surgery. TAP blocks can also be performed by surgeons from the peritoneal cavity before closing the abdominal wall or laparoscopic

guided .



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2) High inspired O2 concentrations peri-operatively:

High inspired O2 concentration of 80% has to be delivered intra-operatively during anaesthesia and post operatively for 6 hours. This high concentration of O2 may be given through face mask.

Polymorphonuclear cells use this molecular oxygen to form free radicals which form the effective line of defense against pathogens post

operatively. This helps in wound healing by synthesizing collagen and helps in angiogenensis.

This high oxygen concentration helps in anastomotic site healing by improving vascular perfusion and has shown to reduce wound infections.

There is also evidence that it minimizes post operative nausea and vomiting.

3) Hypothermia Prevention

Hypothermia should be prevented intra-operatively till the patient recovery is complete. This can be done by using warm air blankets. Warming should be done actively till the temperature is above 36*c. The core body temperature can be measured by an oesophageal probe. Warm intravenous fluids should be used if the procedure is expected to last for more than an hour.

GA disrupts the normal thermoregulatory processes and can result in hypothermia. Hypothermia causes an increase in the incidence ofSSI. SSI occurs due to hypoxia secondary to peripheral vasoconstriction .

Other complications of hypothermia include coagulopathy, increases cardiac morbidity and increases levels of circulating catecholamines with a resultant exaggerated catabolic response.

Hypothermia prevention has been shown to reduce blood loss and prevent infective and cardiac complications.

Warm IV fluids should be used if the procedure is expected to last for more than an hour.

4) Intra-operative Fluid Management:

- Fluid management of Intraoperative scenarios should be a goal directed based on the available parameters. These parameters include but not limited to: electrocardiogram, heart rate, blood pressure, and urine output. In some circumstance where monitors to measure cardiac output and stroke volume are available, fluid therapy should be titrated to optimize cardiac performance or stroke volume (Level of evidence: Moderate-High)
- Perioperative hemodynamics should be considered relative to baseline

values rather than absolute values that need to be maintained. Allowable changes in hemodynamics should be individualized to each patient, but changes in heart rate and blood pressure of < 20% from baseline is most often acceptable (Level of evidence: Moderate-High)

- When hypovolemia is suspected, a fluid challenge of either crystalloid or colloid (200-250 ml) should be tested. The response should be reassessed using the available hemodynamic parameters. The fluid challenge may be repeated based on a positive response e.g. a 10% increase in stroke volume or an increase in blood pressure. Clinical response to fluid challenge may be monitored by change in heart rate, measurement/estimation of the pulse pressure variation, and blood pressure before and after receiving the fluid challenge. Fluid challenge should be repeated until there is no further increase in stroke volume and/or improvement in the clinical parameters .
- Intraoperative crystalloid administration should consist of a balanced salt solution (either Ringer's Lactate or Plasmalyte) (Level of evidence: Moderate-Low)
- The rate of intraoperative fluid for maintenance should not be more than 1-2 ml/kg/hr. The use of an infusion pump may be considered to reduce the risk of fluid overload (Level of evidence: Low)
- The administration of fluid for purposes other than optimization of the

intravascular fluid volume should be avoided. For example, the administration of crystalloid as a carrier for drug administration can be reduced by using an injection port as close to the patient as possible to avoid the need to flush in drugs with large amounts of crystalloid (Level of evidence: Moderate-Low)

- For patients who have had a mechanical bowel preparation, this fluid deficit could be replaced using crystalloid up to 500ml. Response to fluid challenge should be considered in determining the dose of crystalloids (Level of evidence: Low)
- Crystalloid can be used to replace minor blood loss. Acute blood loss during surgery can be replaced with crystalloids or colloids. Colloids should be considered for situations requiring a rapid replacement of intravascular volume (Level of evidence: Moderate- Low)
- Acute blood loss during the surgery can be replaced with the use of colloids on a ratio of 1:1 (Level of evidence: Moderate-Low)
- Use of normal saline should be reserved for patients who are hyponatremic or hypochloremic (for example, those where there is drainage of large volumes of gastric fluid or pre-existing derangements from diuretic use) (Level of evidence: Moderate-Low)

The cardiac output should be continuously measured using an oesophageal Doppler probe and fluid administration should be titrated according to variation in the cardiac output.

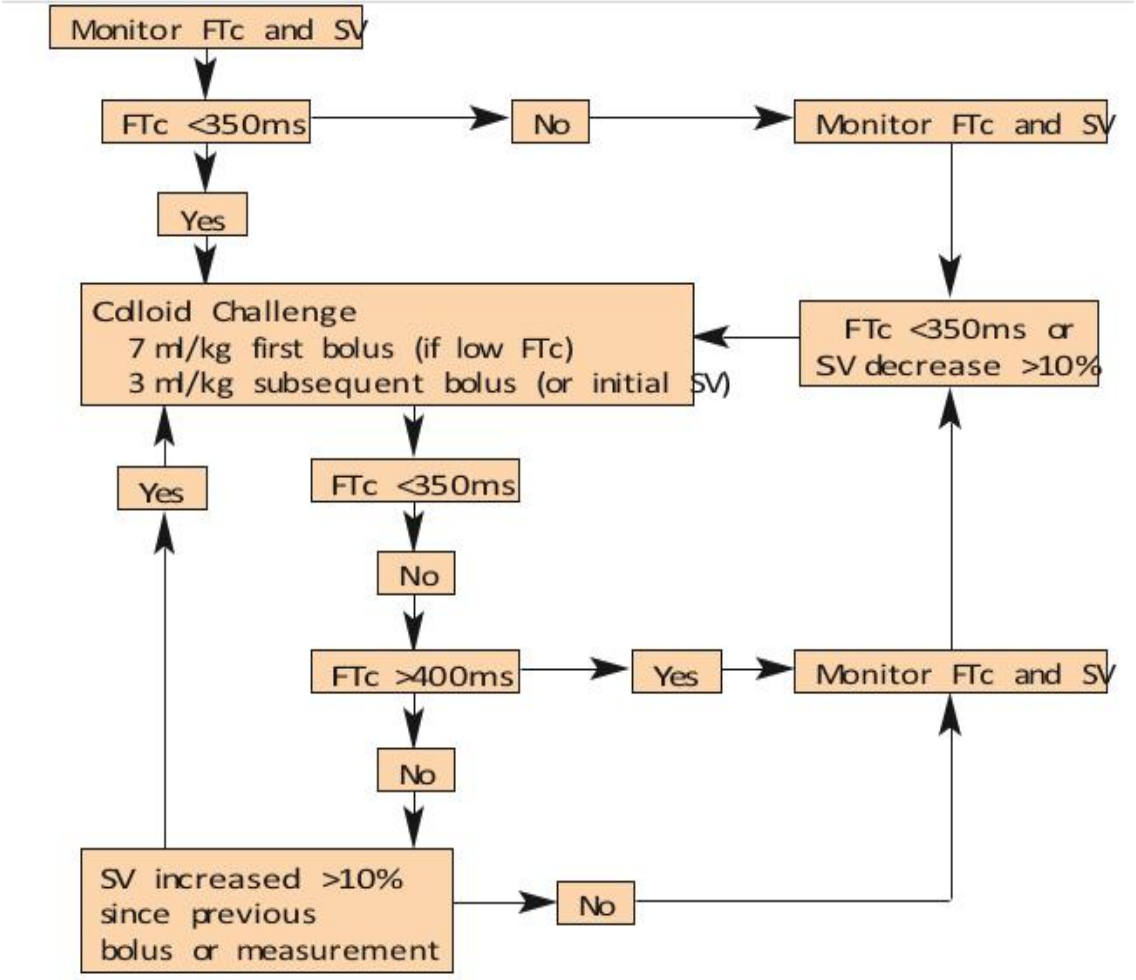
Intra-operative splanchnic hypoperfusion may go undetected with conventional monitoring, and this hypoperfusion causes delay of return of gut function.

It can lead to bacterial translocation across the gut wall which can result in sepsis

Administration of excessive amounts of fluid during surgery can also result in delayed return of gut function and cardiac morbidity.

An oesophageal Doppler probe can be used to determine the hemodynamic status in the peri-operative period and allows guided fluid management.

LiDCO plus and LiDCO rapid and may be used instead of the oesophageal Doppler which are other minimally invasive methods of optimising the fluid balance .These systems depend on a Lithium dilution technique to measure changes in haemodynamic parameters, such as cardiac output and stroke volume, and provide continuous real-time measurements.



Fluid administration using Oesophageal Doppler.

Haemodynamic management Intraoperative period:

Intraoperative fluid therapy aims to administer balanced crystalloid solutions to cover the needs derived from the salt–water homoeostasis. This is in contrast to volume therapy where goal-directed boluses of intravenous solutions are administered to treat objective evidence of hypovolaemia, and consequently improve intravascular volume and circulatory flow.

Intraoperative fluid therapy should aim to maintain a near-zero fluid balance and substantial weight gain of more than 2.5 kg should be avoided. Intraoperative fluid requirements can be met with a basal crystalloid infusion rate of 32 ml/kg/h. Crystalloid excess increases the risk of pulmonary complications, prolonged ileus and delayed recovery.

Crystalloid isotonic balanced solutions should be preferred and 0.9% saline solutions avoided. Hyperchloraemia caused by the use of 0.9% saline solutions has been associated with kidney dysfunction prolonged hospital stay and increased 30-daymortality.

5) SURGICAL INCISIONS:

. For open surgery, a lower transverse incision must be used whenever possible. If a transverse incision is not possible, a lower or upper midline incision could be made. The length of the incision should be kept as short as possible.

Consider these techniques when planning for a gastro intestinal surgery.. Short transverse incisions produces less pain, does not impair lung function significantly and the dose of analgesic required is less when compared to vertical incisions. Studies have shown that the incidence of wound gaping is less when compared to vertical incisions.

6) Avoidance of DT and NG tubes:

Routine way of placing a abdominal drains and nasogastric tubes must be avoided. A NG tube may be inserted and removed at the end if gastric decompression is required during surgery.

Nasogastric tubes decompression causes delay in return of gut function. It also causes pulmonary complications , promotes fever thereby prolonging the length of hospital stay.

Traditionally abdominal drains are placed to evacuate collections at the site of surgery and drain any anastomotic leak. It causes discomfort and can hinder mobilisation.

POST-OPERATIVE COMPONENTS:

1) Use of Paracetamol and non steroidal anti-inflammatory drugs(NSAIDS) and the opiates avoidance:

Post operatively patients should be administerd with Paracetamol as analgesic. NSAIDS like brufen or Diclofenac can be used for break through pain. At all duration, when opiates are used, antiemetics should be given in prior to prevent nausea and vomiting.

The delay of return of gut function have been shown to be caused by the usage of opiates. They also cause nausea aand vomiting.Opiate avoidance the use of Codeine and Tramadol. Instead of opiates, patients must be administerd paracetamol and NSAIDS.

ERAS

Preoperative	• Acetaminophen IV or PO [4, 11, 12] • Cyclo-oxygenase-2 (Cox -2) inhibitor or nonsteroidal anti-inflammatory PO [4, 11, 12, 13] • Gabapentinoids PO [4, 12, 13]
Intraoperative	• Ketamine IV [4, 12, 13] • Local/regional anesthesia [4, 8, 11, 13] • Opioid IV [4, 12]
Postoperative	• Acetaminophen IV or PO [4, 11, 12, 13] • NSAIDS or Cox-2 inhibitor IV or PO [4, 8, 11, 12, 13] • Gabapentinoids PO [4, 8, 13] • Ketamine infusion IV [13] • Opioids PO [4, 12, 13]

2) Early postoperative diet:

Patients must be started on oral fluids on the evening of the surgery and built up to liquid diet on 1st pod, semisolid diet on 2nd pod with solid diet from 3rd pod. Patients who are not meeting their nutritional requirements by 72 hours after surgery should be assessed by a dietician.

Studies have shown recently that early enteral feeding(within 24 hours post-operatively) has been shown to be safe. Early enteral feeding has also shown to reduce the risks of anastomotic leak, infections and reduces the length of hospital stay.

Clinical Pathway: Colorectal Early Recovery After Surgery (ERAS)

Diagnosis: All elective Colorectal Surgical Procedures—MEDIAN LOS: 3

Pre and Post-Op Day	Protocol
Surgical Clinic	· Screen for malnutrition: o Weight loss > 10% body weight
Day Prior to Surgery	· Regular diet until 6pm when Golytely starts and then clear liquids (if applicable)
Day of Surgery: **Surgical Admissions Suite (SAS)** (Gatorade/	·Clear liquids until 2 hours prior to surgery · Carbohydrate drink for morning of surgery Powerade)—20oz bottle
Day of Surgery: **Post anesthesia care unit (PACU)**	· Clear liquids as tolerated
Day of Surgery: Acute Care are	· Clear liquid diet immediately after surgery.-Patients permitted soft diet items as tolerated – ice chips, ice cream, jello, pudding, etc. · Clear liquids as tolerated
POD1	· Clear liquids as tolerated ·Transitional (soft) diet to start lunchtime on POD1
POD2	·Regular diet to start on POD2
POD3/Day of Discharge	· Regular diet

How to order the diet:

Diet order entered as "Transitional"

Description:

This diet is designed to be used after surgery and indicated in patients who have nausea or are just beginning to take an oral diet after a prolonged period NPO, prior to advancing to regular diet. It consists of patient and research reported tolerable foods and beverages after surgery and is more nutritionally adequate than the traditionally used clear liquid diet. Once the patient demonstrates tolerance to this diet, their diet can be advanced to a regular diet or another therapeutic diet based on the patient's clinical condition.

Nutritional Adequacy:

The Transitional Diet nutritional adequacy varies significantly based on the items selected by patients. The nutrient content can be inadequate to meet DRIs but this diet is meant to be used for a short period of time.

Food Group	Foods Allowed	Foods Excluded
Beverages	All: Juice, milk, soda, coffee, tea (hot or iced); Ensure, Carnation Instant Breakfast, Resource Breeze, etc.	None
Cereals, Breads crackers **and Grains**	Soft breads, toast, Muffins Cooked or dry cereals	
Vegetables	Cooked vegetables Vegetable juices Soups Potatoes	Raw vegetables, salads
Fruit and Juices	Fruit Juices Applesauce Fresh Fruits: banana, melon, peaches, under "food allowed" pears, oranges Canned peaches, pears, apricots, pineapple, fruit cocktail, citrus sections	Dried fruit Fresh fruits not listed
Milk	Cottage Cheese Cheese Milk Yogurt	None
Meats and Meat Substitutes	Tender meat, fish, poultry or egg salads Eggs Peanut butter Cheese Cottage Cheese	Tough fibrous meats (e.g., sausage casings)
Fats	All	Fried foods
Desserts	Graham crackers, vanilla wafers Popsicles, gelatin, pudding Yogurt Ice cream Sherbet consistency custard	Desserts containing nuts, coarse dried fruit, or tough fruit Cake, tender cookies Desserts baked to a hard
Condiments	All	None

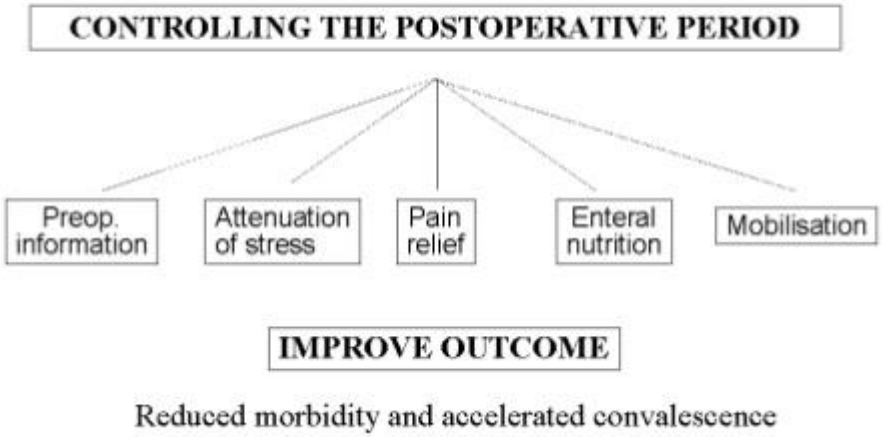
Transitional Menu:

Breakfast	Lunch	Dinner
Low Cholesterol Scrambled Eggs	Broth-based soup (regular soup)	Chicken salad sandwich on white bread
Toast (white)	Grilled cheese sandwich on white bread	Mashed Potatoes
Yogurt	Saltines	Canned fruit
Jello	Banana or fresh fruit cup	Vanilla wafers
Margarine	Jello	Yogurt
Jelly	Iced tea	
Coffee or hot tea	Sugar	
Sugar and Creamer		

3) Early mobilisation:

Patients has to be helped to sit out in a chair on the evening of surgery followed by making patient ambulant on the same day or from 1st POD. The physiotherapist should help patients in early mobilization.

Continuous patient education regarding the benefits of mobilisation is recommended. It was shown in a randomised trial that avoidance of bed-side entertainment systems is one pragmatic approach to encourage mobilisation.

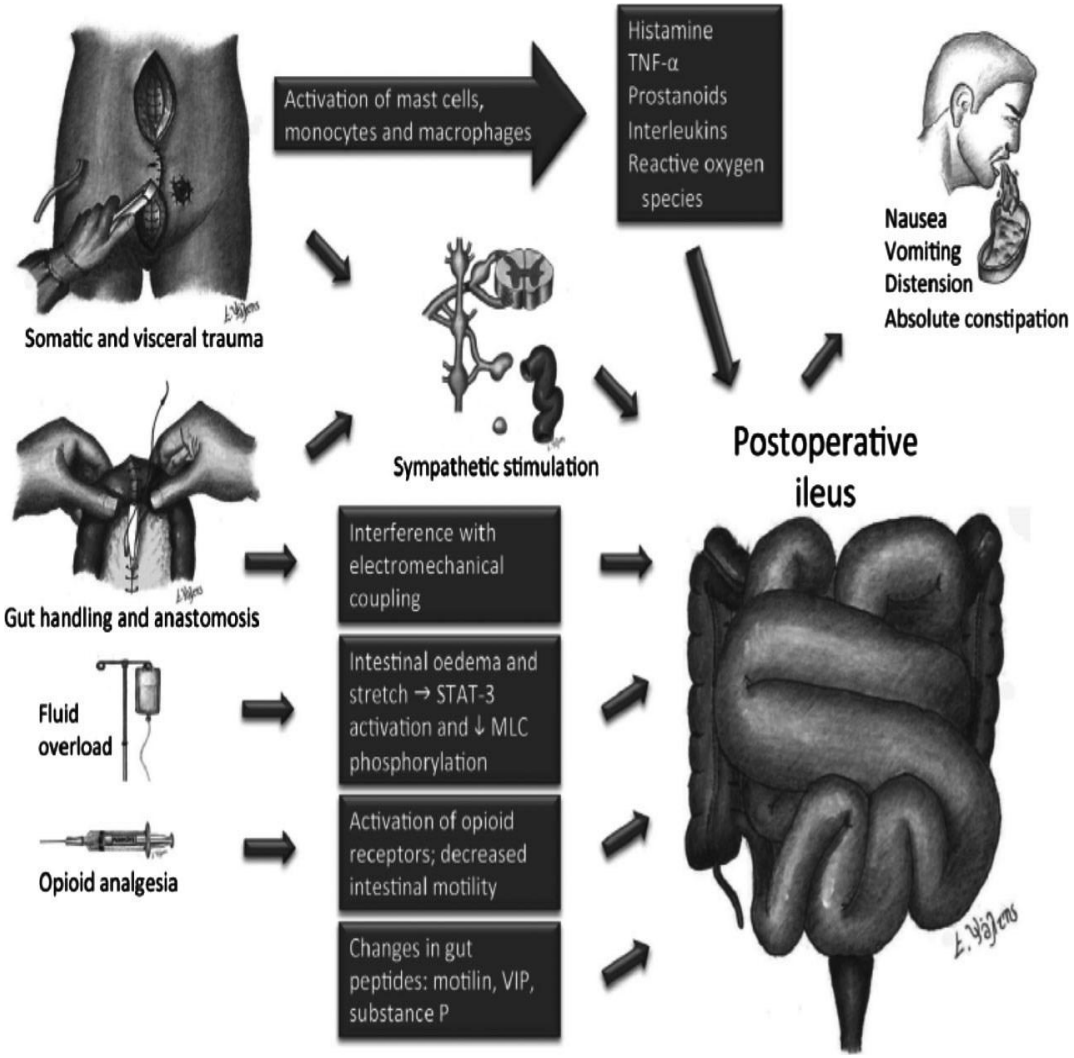


4) Restricted amounts of FlUID MANAGEMENT:

- Patients who do not have adequate oral intake should receive not more than 75 mL/hr of 2/3-1/3 with 20 mEq potassium/day, or a similar rate using a balanced salt solution if electrolyte replacement is required. The routine use of saline is to be discouraged (Level of evidence: Moderate-Low)

- Postoperatively, volume status should be assessed before fluid boluses are given. Boluses should not be given because of low urine output or low blood pressure alone. Instead, the blood pressure, heart rate, urine output and mental status of patients should all be considered. In addition, the preoperative blood pressure should be

considered when making decisions about the postoperative volume status (Level of evidence: Moderate-Low)

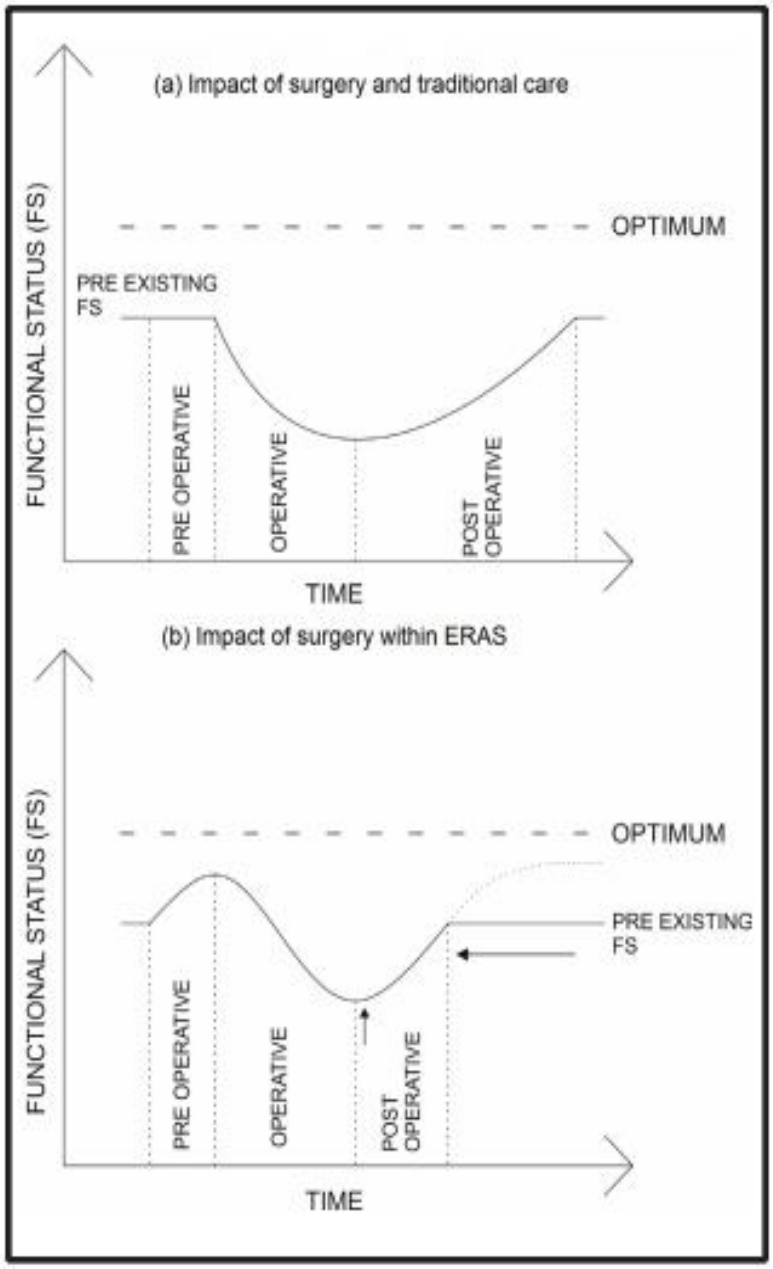


Haemodynamic management Postoperative period:

Early oral intake of fluids and solids following abdominal surgery should be encouraged. If oral intake is tolerated, routine intravenous fluid administration should be discontinued after PACU discharge and restarted only if clinically indicated. In the absence of surgical losses to cover physiological needs patients should be encouraged to drink 25–35 ml/kg of water per day (1.75–2.75 l for an average person).

After ensuring the patient is normovolaemic, hypotensive patients receiving epidural analgesia should be treated with vaso-pressors.

Impact of Surgery with ERAS Vs. Traditional Care:



Special Circumstances:

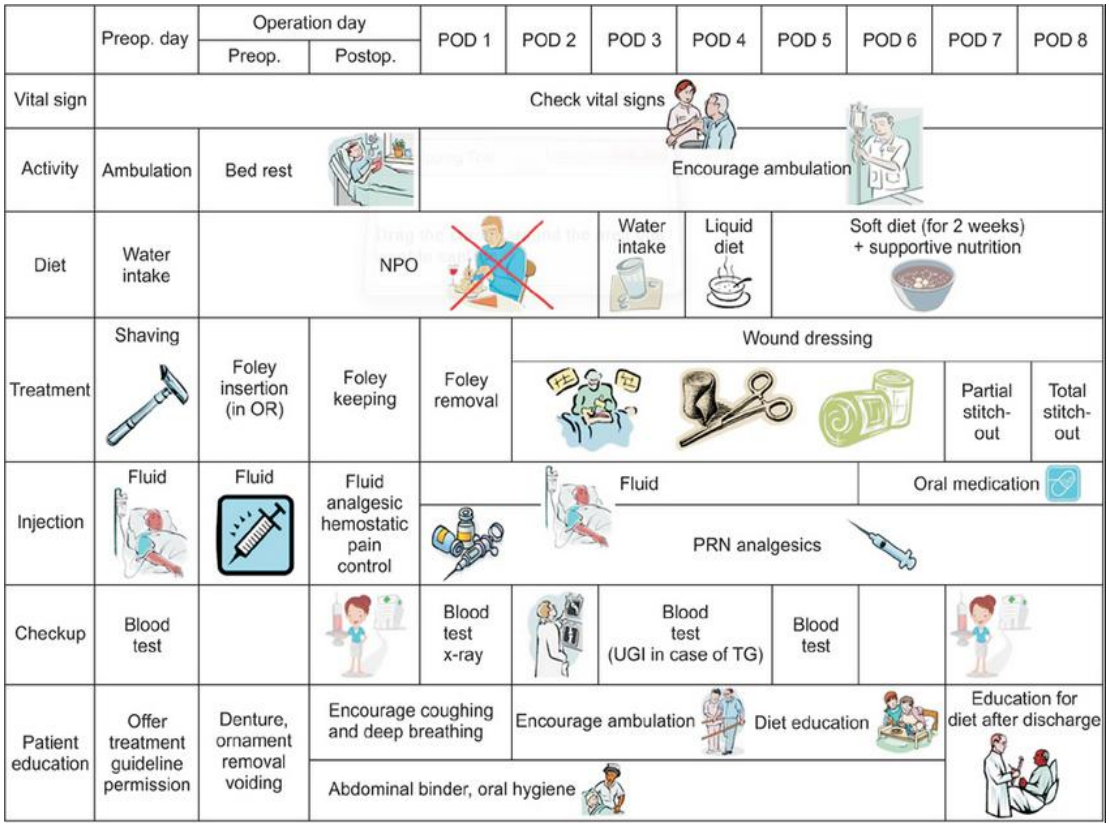
1) Elderly patients and those with high co-morbidity:

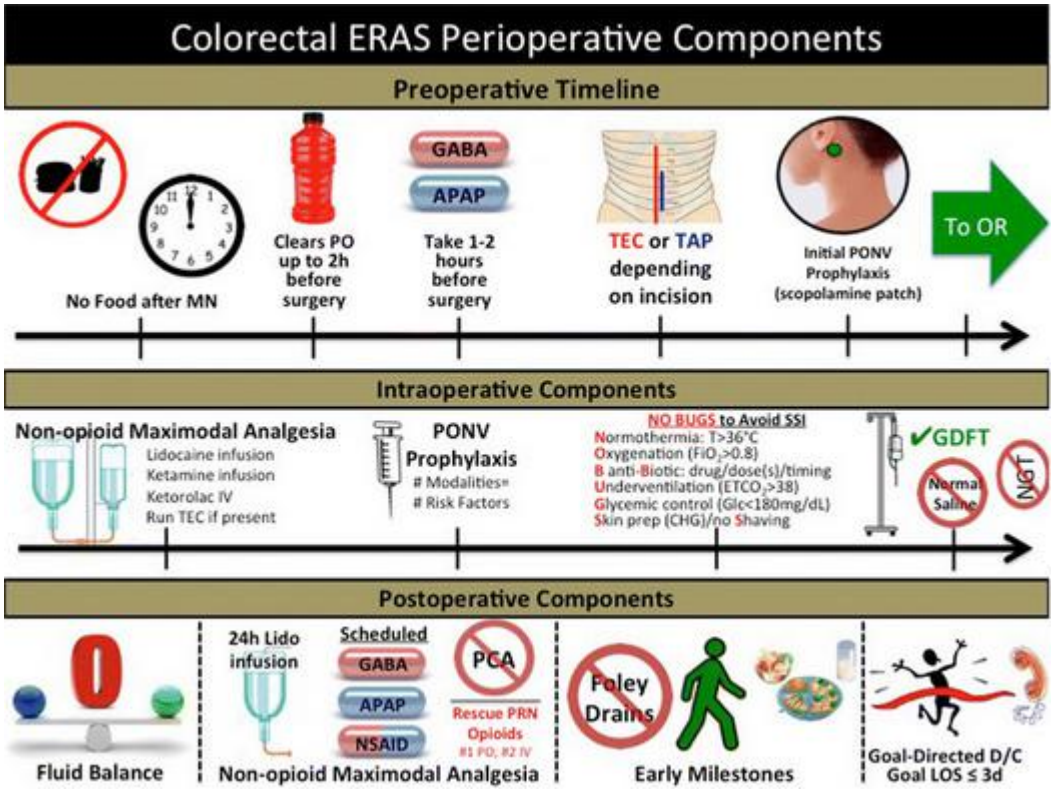
Such patients have been shown to benefit from enhanced recovery and should be included in these programmes. There is no evidence for concern in including ASA 3 and 4 patients into ERAS programmes, although the literature in this area is limited . Elderly patients may not be able to cope at home after discharge if there is no one to assist them. This may delay patient discharge, cognisant of the fact that the overarching aim of ERAS is to enhance post-operative recovery, not to discharge patients home earlier. The elderly may require a degree of input after discharge and this may be in the form of regular telephone calls, a home-visit by a health care professional or even by a relative. Therefore, discharge planning should be initiated at a very early stage for these patients.

Certain components of ERAS protocols may be even more relevant in this cohort of patients. For example, Doppler guided fluid therapy may be particularly useful in the elderly and high risk patients in whom accurate fluid administration is possibly more important due to the increased risk of fluid overload.

2) Emergency surgery:

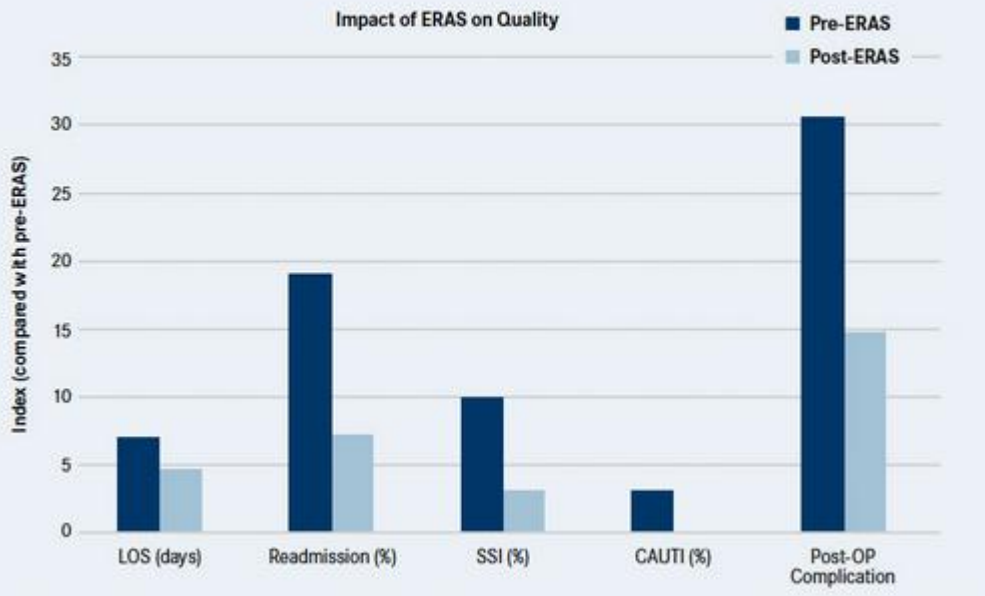
Although ERAS pathways have been primarily studied in the elective setting, they should still be applied to the emergency situation. Although in emergencies implementation of the preoperative components may not be possible, every effort should be made to implement as many components as possible.




Colorectal ERAS Perioperative Components
Preoperative Timeline
No Food after MN
Clears PO up to 2h before surgery
GABA
APAP
Take 1-2 hours before surgery
TEC or TAP depending on incision
Initial PONV Prophylaxis (scopolamine patch)
To OR
Intraoperative Components
Non-opioid Maximodal Analgesia
Lidocaine infusion
Ketamine infusion
Ketorolac IV
Run TEC if present
PONV Prophylaxis
Modalities»
Risk Factors
NO BUGS to Avoid SSI
Normothermia: T>36°C
Oxygenation (FiO2>0.8)
B anti-Biotic: drug/dose(s)/timing
Underventilation (ETCO2>38)
Glycemic control (Glc<180mg/dL)
Skin prep (CHG)/no Shaving
✔GDFT
Normal Saline
NGT
Postoperative Components
Fluid Balance
24h Lido infusion
Scheduled
GABA
APAP
NSAID
PCA
Rescue PRN Opioids
#1 PO, #2 IV
Non-opioid Maximodal Analgesia
Foley
Drains
Early Milestones
Goal-Directed D/C
Goal LOS ≤ 3d


ERAS® Interactive Audit System
Analysis & Reports
2010 2011 2012 2013 2014 2015
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
More Filters
Records: 885 of 16136
DASHBOARD TRENDS COMPLIANCE OUTCOMES PATIENT DATA OTHER
Avg Total Length of Stay: 10.8
Bar chart Trend
10.2
0.6
10.8
0.4
Primary Stay
Readmission
Total Stay
Intensive Care
ERAS Compliance: 81%
100%
50%
0%
201005 201107 201203 201211 201307 201403 201411
Complications (Primary and Flw-up)
Wound infection 12%
Nausea or vomiting 11%
Mechanical bowe... 11%
Urinary retention 9%
Obstipation or di... 7%
Pneumonia 6%
Intraperitoneal or... 6%
Other adverse ev... 6%
Number of Operations
Ileocaecal/right h... 180
Sigmoid resection 177
Other stoma pro... 170
Anterior resectio... 127
Left hemicolectomy 61
Reversal of Hart... 52
Total/Subtotal col... 34
Abdominoperin... 22
Occurence (no.)
Mortality 11
Reoperations 107
Pts with Complications 461
Pts with Serious Complicatio... 129
Anastomotic Leaks 40

Differences in length of stay and complications before and after implementation of enhanced recovery



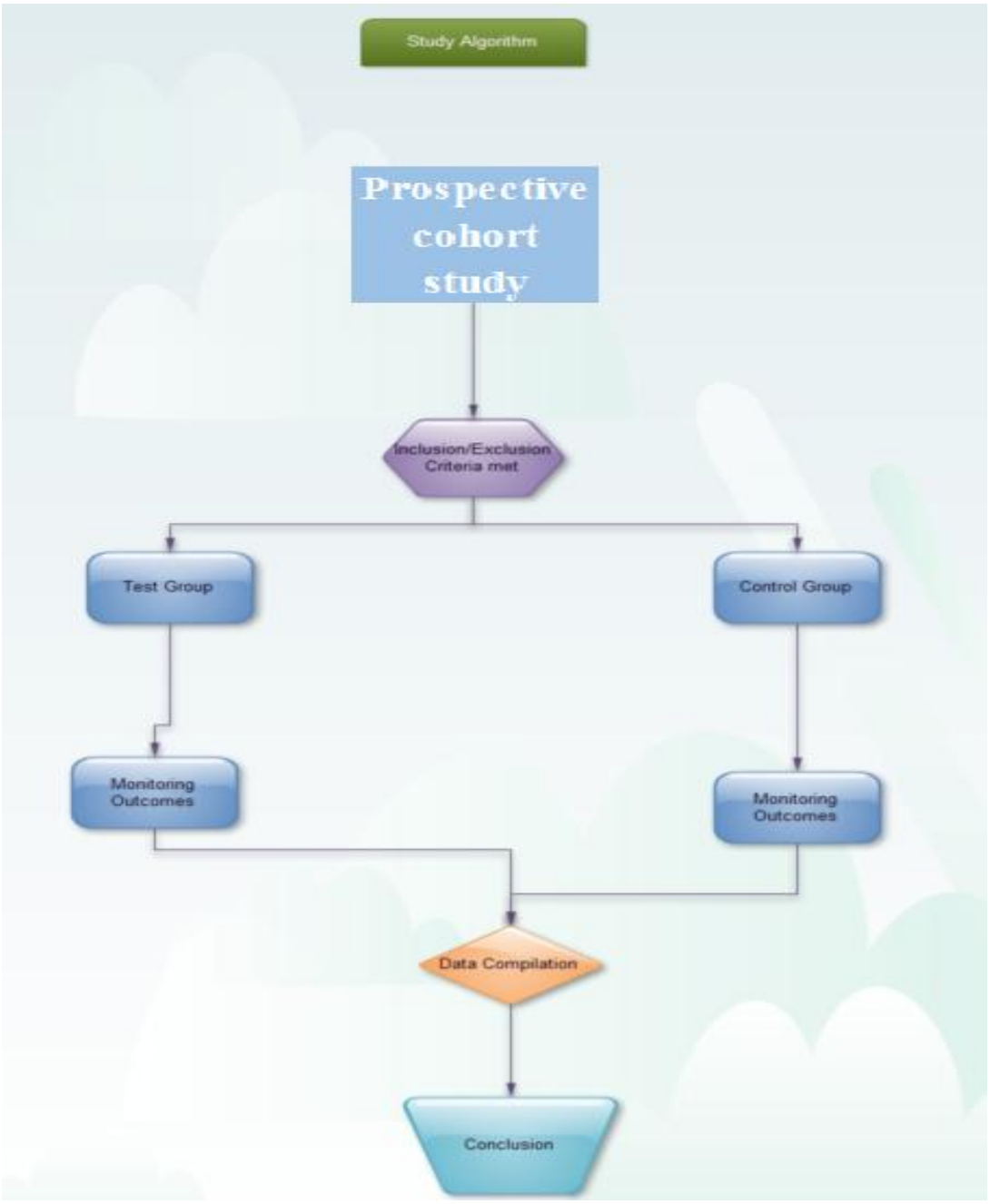
CAUTI indicates catheter-associated urinary tract infections; ERAS, enhanced recovery after surgery; LOS, length of stay; SSI, surgical site infection.

Continued audit should permit such problems to be detected early, and necessary modifications made to discharge criteria, so as to ensure that patients receive the best possible care..

Regular auditing and dissemination of results should be undertaken. Wherever possible, an active research programme on ERAS related issues is recommended. Regular audit and research can facilitate the development of local ERAS protocols tailored to the specific requirements of the institution.

METHODOLOGY OF THE STUDY

The following study was conducted in Stanley medical college & hospital . It is a prospective cohort international study , the source of the study being patients admitted in general surgery wards for gastrointestinal surgeries . The period of study was from october 2016 to june 2017 . Inclusion and exclusion criteria were made, only those patients satisfying both those criterias were included in the study.


Study Algorithm
Prospective cohort study
Inclusion/Exclusion Criteria met
Test Group
Control Group
Monitoring Outcomes
Monitoring Outcomes
Data Compilation
Conclusion

Criteria for patients undergoing gastrointestinal surgeries:

INCLUSION CRITERIA	EXCLUSION CRITERIA
*Patients undergoing gastrointestinal surgery. *Age > 12 years	*Immuno compromised. *Emergency surgeries. *Relaparotomies *Laproscopic GIT surgeries

Patients admitted in my unit for gastrointestinal surgeries formed the test group while patients admitted in other units formed the control group .

The sample size of this study was

Test Group - 20 patients

Control Group - 20 patients

Patient admitted in general surgery ward , who fulfilled both inclusion and exclusion criteria were selected . The patients and the attenders were informed about the nature of study, the work up, the components of study and the complications that may happen and those patients who gave consent alone were included in this study . patients from my unit were made into test group and others as control group.

A proforma was prepared to record the findings.

1) PRE-OP COUNSELLING:

In the test group of 20 patients undergoing GIT surgeries,each patient and their attenders were counseled adequately.clear instructions were given regarding

-the nature of disease.

-the surgical procedure to be done.

-core components and its benefits.

-what the patient should expect during the course of hospital stay.

-instructions regarding early mobilisation, early feeding and breathing exercises after surgery.

-counselling regarding active participation of patients themselves in the recovery after surgery.

-patients who might have stoma were explained in detail about the stoma and the patients and attenders were appropriately trained for stoma care and counselled regarding quality of life with stoma even before surgery.

-then pre-operative education has shown to improve patients satisfaction and allay anxiety.

2) OPTIMISATION OF CO-MORBIDITIES:

-Patients were given adequate breathing exercises.

-alcoholics and smokers were made to sustain from it.

-nutritional status were improved.

-other medical co-morbidities were corrected and made fit for surgery. This has enhanced post-operative recovery.

3) MINIMAL STARVATION AND CARBOHYDRATE LOADING:

-patients posted for surgery were kept in nil per oral for maximum of 6 hours before surgery.

- two hours before surgery they were administered 100 ml of 25% dextrose and 500ml of 0.9%NACL.

4) AVOIDANCE OF MECHANICAL BOWEL PREPARATION:

-Oral mechanical bowel preparation were not done.

-surgeries involving left sided anastamosis of colon, patients were given single phosphate enema on the morning of surgery.

5) DEEP VEIN THROMBOSIS PROPHYLAXIS:

-All patients in the study were started on Deep vein thrombosis prophylaxis.

-they were given injection. enoxaparin (low molecular weight heparin 20 microgram subcutaneously, night before surgery and continued for entire length of hospital stay as OD.

-those patients at high risk of DVT ,the prophylaxis were continued for upto one month after surgery.

6) ANTIBIOTIC PROPHYLAXIS:

-injection ceftriaxone 1g IV stat dose was given just prior to skin incision.

-for prolonged procedures (>4 hours),second dose was administered.

INTRA OPERATIVELY:

1) EPIDURAL ANALGESIA AND LOCAL BLOCKS:

-all patients received epidural analgesia and continued it for 48 hours post-operatively.

- few patients were given transverse abdominis plane block when epidural catheters were not available in our centre as an alternative.

2) SURGICAL APPROACH AND INCISION:

-in this study only open surgeries were included and the length of the incision were kept to the minimum as possible.

-a lower transverse incision was made whenever possible.

3) AVOIDANCE OF POST-OPERATIVE DRAINS,NASOGASTRIC TUBES AND URINARY CATHETERS:

-Routine nasogastric tube ,drain tube were avoided.

-when nasogatric or drain tubes were placed ,they were removed just after the purpose of keeping it was fulfilled.

POST OPERATIVE COMPONENTS:

1) AVOIDANCE OF OPIATES :

Post-operatively patients were on epidural analgesia for 48 hours

-after it was removed they were administered IV paracetamol infusion and diclofenac/brufen for breakthrough pain.

2) EARLY POSTOPERATIVE DIET:

-Patients were started on oral fluids on 1st post operative days.

-for patients with colostomy, oral diet was started within 24 hours post-operatively.

-semisolid diet was started on 2nd POD.

3) EARLY POSTOPERATIVE MOBILISATION:

-Patients were helped to sit in a chair on the evening of surgery, they were made ambulant from the 1st pod itself.

-The study patients were managed in the post-operative ward, examined daily with PTR/BP/I/O CHARTS,blood investigations like CBC,RFT,S.ELECTROLYTES were done everyday and assessed. Complaints by patients were attended to immediately.

-Regular wound dressings were done. Patients with Surgical site infections were managed with wound dressings and antibiotics according to culture and sensitivity.

-The other complications like anastomotic leak with enterocutaneous fistula were managed conservatively as per the protocol with special concern to hydration,diet ,antibiotic and strict monitoring of vitals.

-Patients with enterocutaneous fistulas were eventually healed.

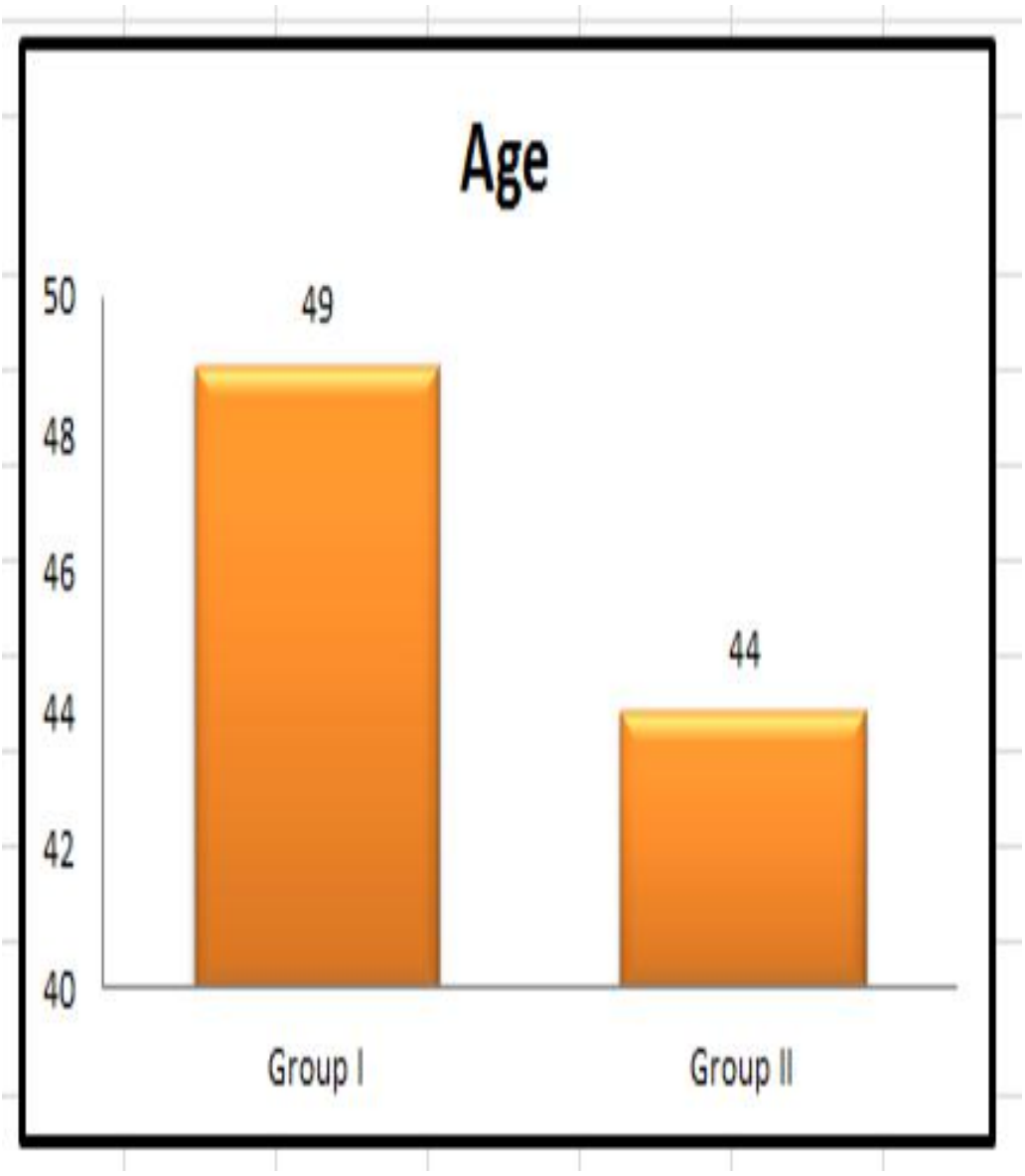
All patients were followed up for a month after discharge with regular weekly review and complications arising after discharge were also noted.

DATA EXTRACTION & STATISTICAL ANALYSIS

The collected data were analysed with IBM.SPSS statistics software 23.0 Version.To describe about the data descriptive statistics frequency analysis, percentage analysis were used for categorical variables and the mean & S.D were used for continuous variables. To find the significant difference between the bivariate samples Independent groups the Unpaired sample t-test was used.To find the significance in categorical data Chi-Square test was used. In both the above statistical tools the probability value .05 is considered as significant level.

P - Value	** Highly Significant at P ≤ .01
P -Value	# No Significant at P >.05

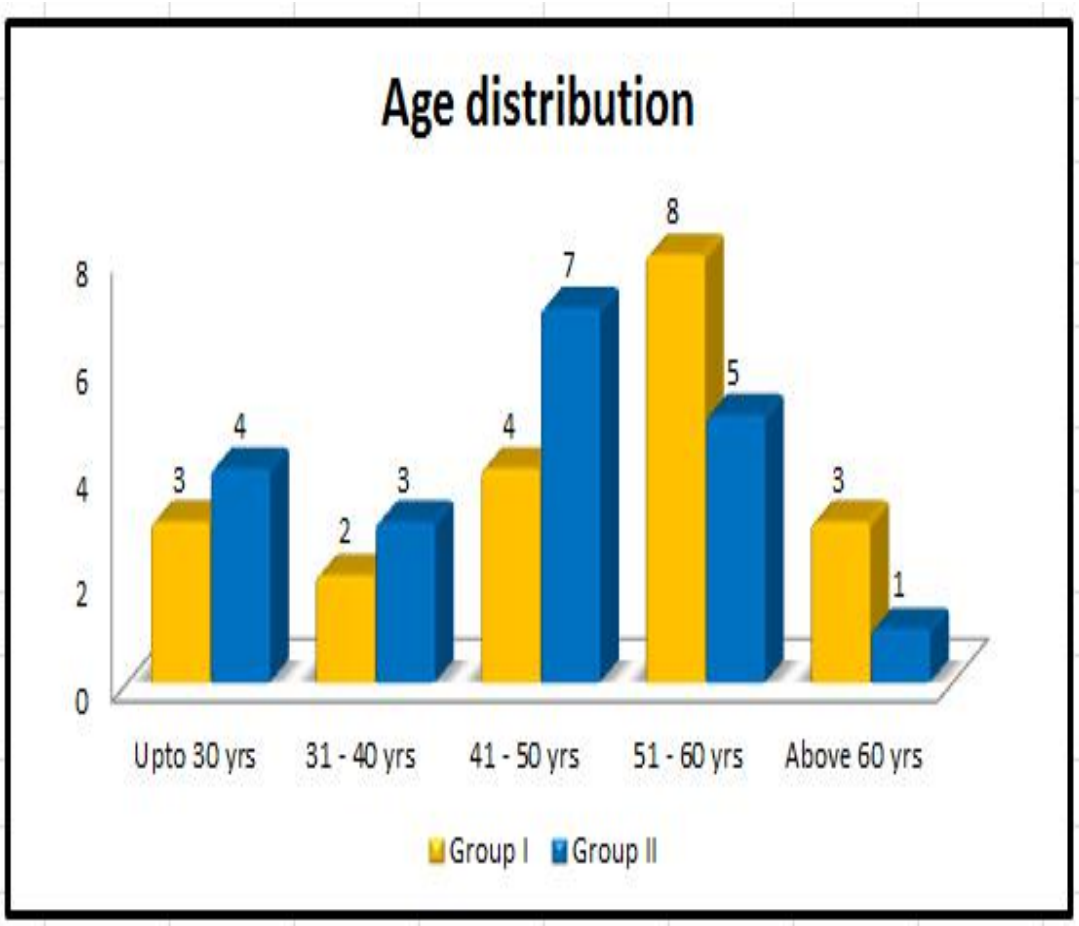
Age Criteria:



The average age group of patients in test group is 49.

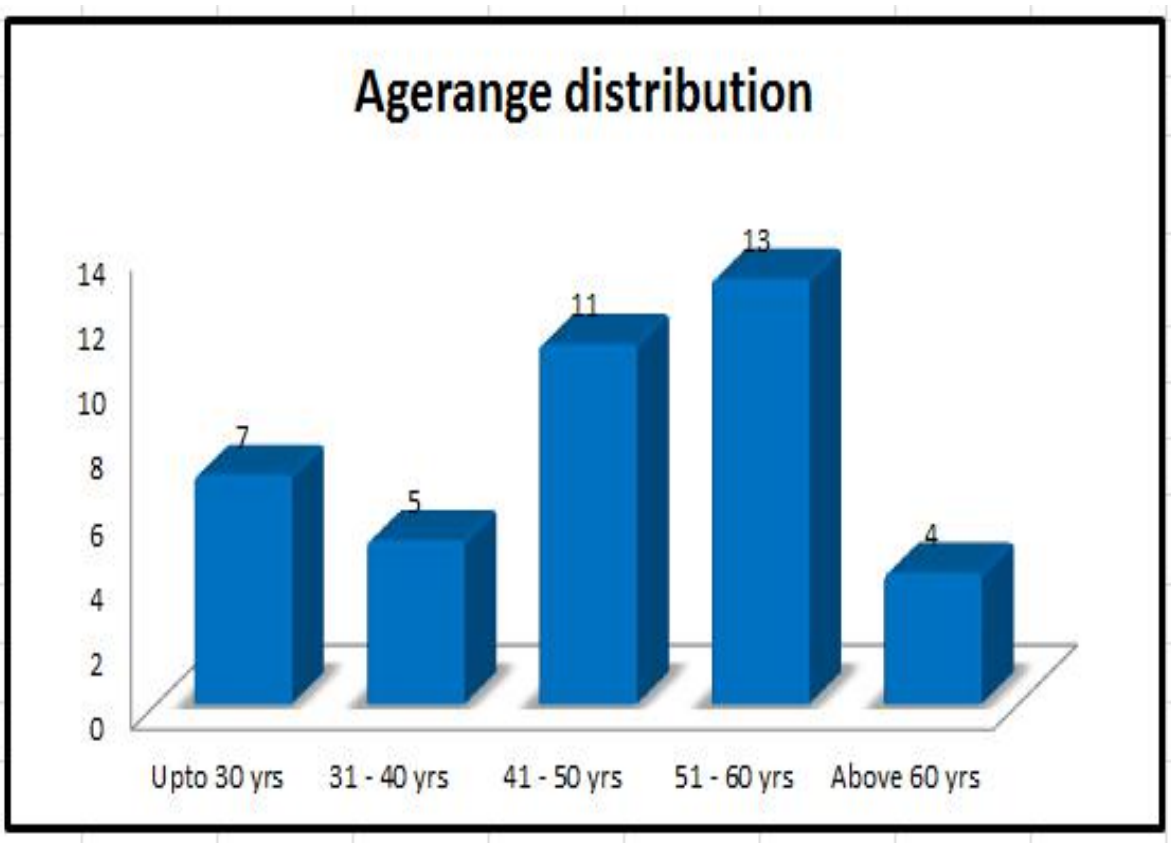
The average age group of patients in control is 44.

Distribution on age:



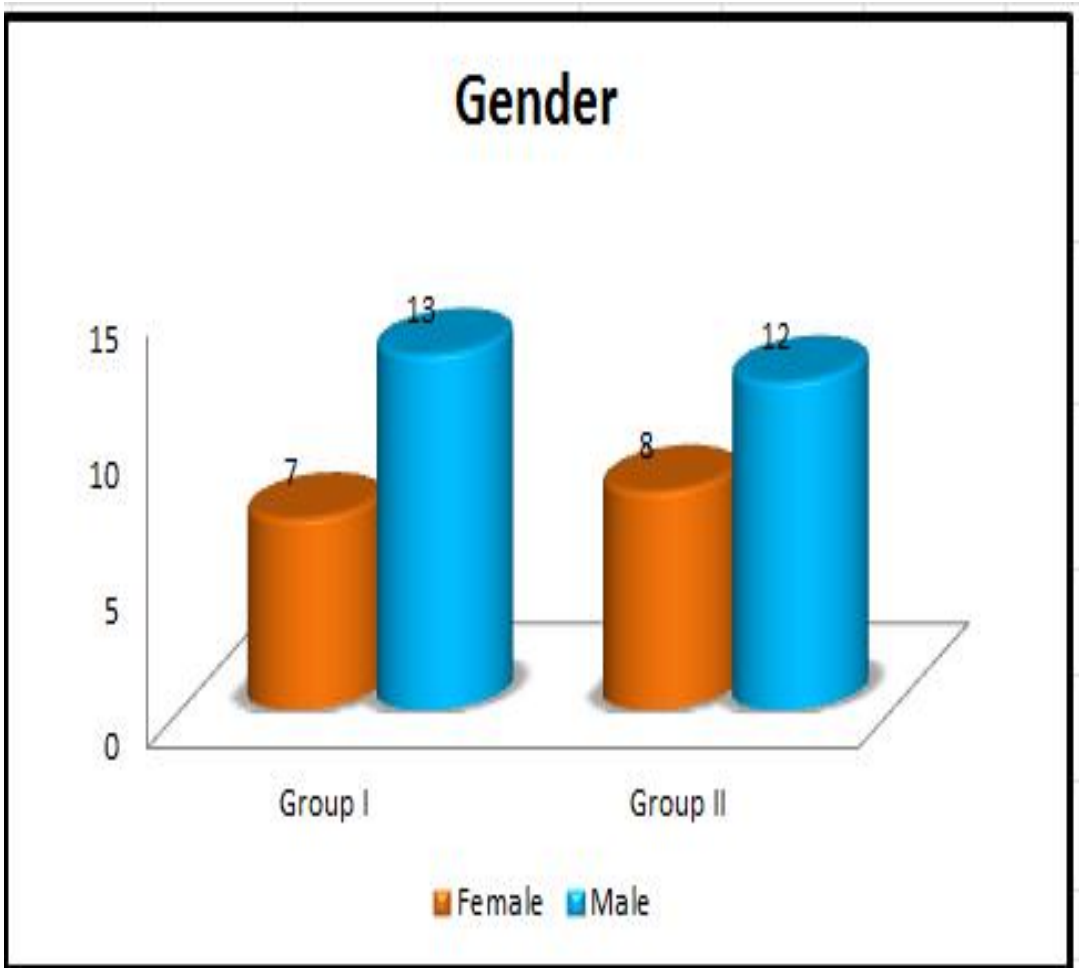
Patients with age group of 51-60 years form most of the study group.

Patients with age group of 41-50 years form most of the control group.



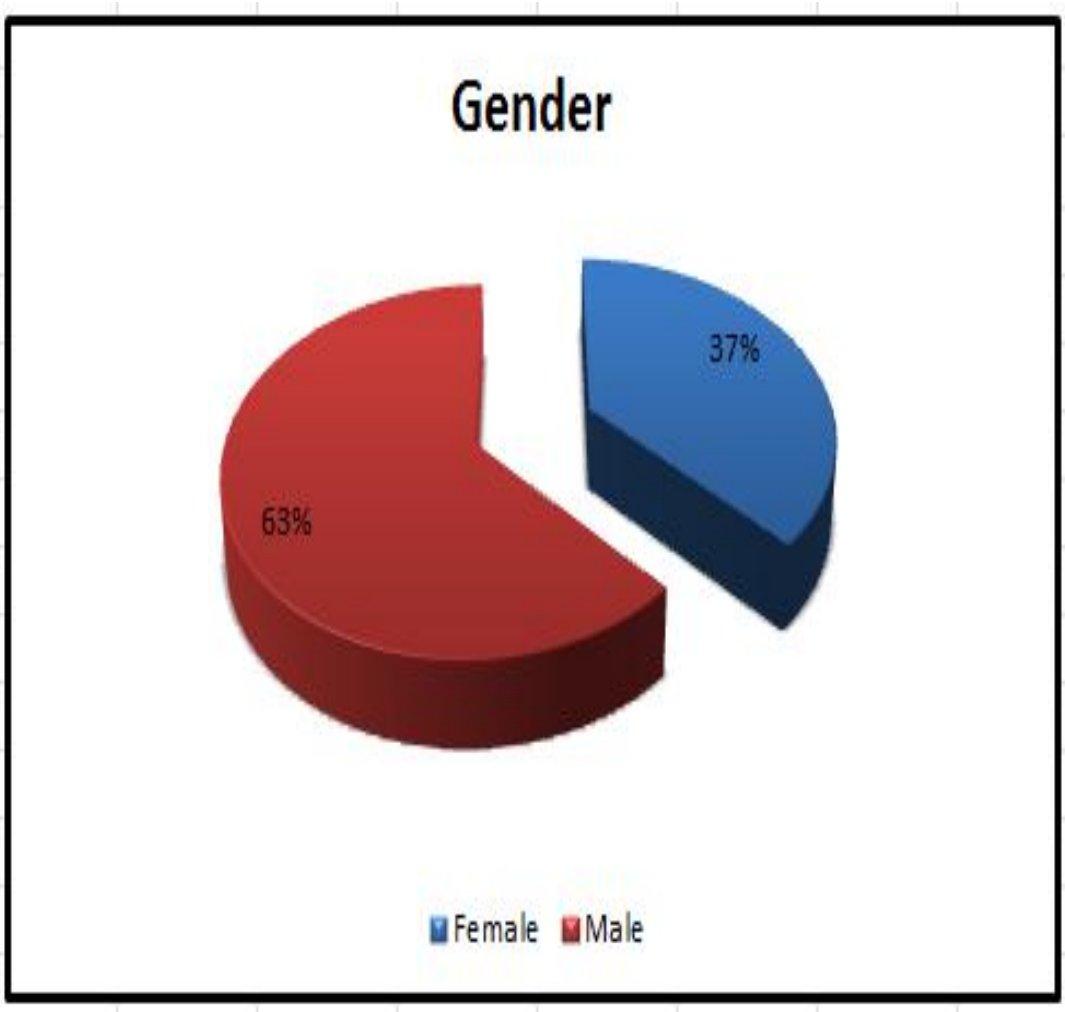
Patients with age group of 50-60 years forms most of the study population.

Gender variation:



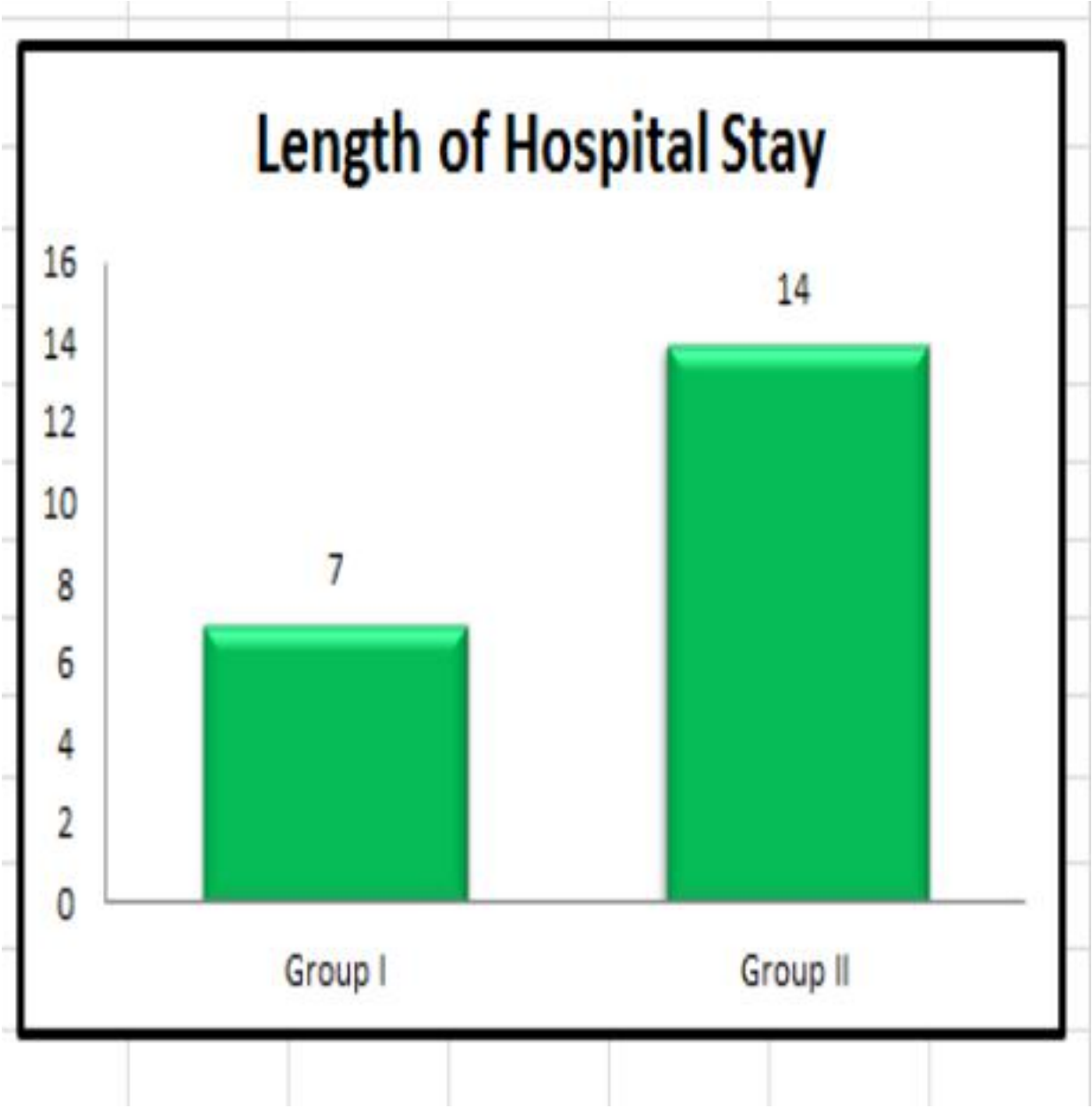
Test group patients have an average of 13 male and 7 female patients.

Control group patients have an average of 12 male and 8 female patients.



Male patients form 63% of total population.

Female patients form 37% of total population

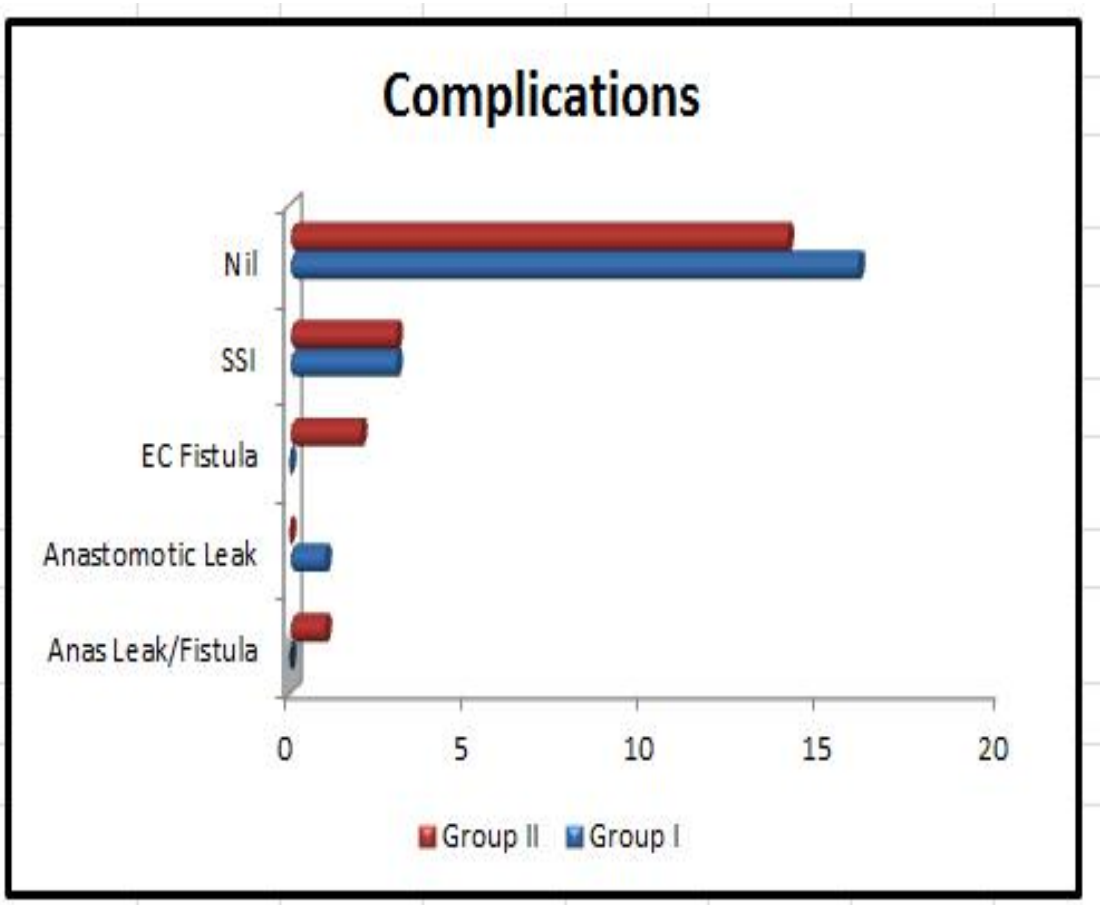


There is significant ddifference in the length of hospital stay between study group and control group.

Average length of hospital stay for study group is 7 days

Average length of hospital stay for control group is 14 days

Complication scenario:



Study group has overall fewer complications when compared to control group.

Group Statistics

	Groups	N	Mean	Std. Deviation	Std. Error Mean
AGE	1	20	49.30	11.819	2.643
	2	20	44.40	12.935	2.892
Hospital stay	1	20	6.70	2.618	.585
	2	20	14.40	2.909	.651

Independent Samples Test

	t-test for Equality of Means		
	t	df	Sig. (2-tailed)
AGE	1.251	38	.219
Hospital stay	-8.799	38	.000

Crosstab

			Groups		
			1	2	Total
SEX	F	Count	7	8	15
		% within Groups	35.0%	40.0%	37.5%
	M	Count	13	12	25
		% within Groups	65.0%	60.0%	62.5%
Total		Count	20	20	40
		% within Groups	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.107[a]	1	.744		
Continuity Correction[b]	0.000	1	1.000		
Likelihood Ratio	.107	1	.744		
Fisher's Exact Test				1.000	.500
N of Valid Cases	40				

a. 0 cells (0.0%) have expected count less than 5. The minimum

b. Computed only for a 2x2 table

			Groups		Total
			Group I	Group II	
Complications	Anas	Count	0	1	1
		% within Groups	0.0%	5.0%	2.5%
	Anastomot	Count	1	0	1
		% within Groups	5.0%	0.0%	2.5%
	EC Fistula	Count	0	2	2
		% within Groups	0.0%	10.0%	5.0%
	Nil	Count	16	14	30
		% within Groups	80.0%	70.0%	75.0%
	SSI	Count	3	3	6
		% within Groups	15.0%	15.0%	15.0%
Total		Count	20	20	40
		% within Groups	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.133[a]	4	.388
Likelihood Ratio	5.679	4	.224
N of Valid Cases	40		

Crosstab

			Groups		
			1	2	Total
Complications	Anas Leak/Fistula	Count	0	1	1
		% within Groups	0.0%	5.0%	2.5%
	Anastomotic Leak	Count	1	0	1
		% within Groups	5.0%	0.0%	2.5%
	EC Fistula	Count	0	2	2
		% within Groups	0.0%	10.0%	5.0%
	Nil	Count	16	14	30
		% within Groups	80.0%	70.0%	75.0%
	SSI	Count	3	3	6
		% within Groups	15.0%	15.0%	15.0%
Total		Count	20	20	40
		% within Groups	100.0%	100.0%	100.0%

AGE * Groups Crosstabulation

			Groups		
			Group I	Group II	Total
AGE	Upto 30 yrs	Count	3	4	7
		% within Groups	15.0%	20.0%	17.5%
	31 - 40 yrs	Count	2	3	5
		% within Groups	10.0%	15.0%	12.5%
	41 - 50 yrs	Count	4	7	11
		% within Groups	20.0%	35.0%	27.5%
	51 - 60 yrs	Count	8	5	13
		% within Groups	40.0%	25.0%	32.5%
	Above 60 yrs	Count	3	1	4
		% within Groups	15.0%	5.0%	10.0%
Total		Count	20	20	40
		% within Groups	100.0%	100.0%	100.0%

AGE * Groups Crosstabulation

			Groups		
			1	2	Total
AGE	Upto 30 yrs	Count	3	4	7
		% within Groups	15.0%	20.0%	17.5%
	31 - 40 yrs	Count	2	3	5
		% within Groups	10.0%	15.0%	12.5%
	41 - 50 yrs	Count	4	7	11
		% within Groups	20.0%	35.0%	27.5%
	51 - 60 yrs	Count	8	5	13
		% within Groups	40.0%	25.0%	32.5%
	Above 60 yrs	Count	3	1	4
		% within Groups	15.0%	5.0%	10.0%
Total		Count	20	20	40
		% within Groups	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.853[a]	4	.583
Likelihood Ratio	2.918	4	.572
Linear-by-Linear Association	1.575	1	.209
N of Valid Cases	40		

SEX

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	15	37.5	37.5	37.5
	Male	25	62.5	62.5	100.0
	Total	40	100.0	100.0	

AGE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Upto 30 yrs	7	17.5	17.5	17.5
	31 - 40 yrs	5	12.5	12.5	30.0
	41 - 50 yrs	11	27.5	27.5	57.5
	51 - 60 yrs	13	32.5	32.5	90.0
	Above 60 yrs	4	10.0	10.0	100.0
	Total	40	100.0	100.0	

DISCUSSION

In this study of comparing the effectiveness of ERAS with conventional way of management of patients undergoing gastrointestinal surgeries

Test (Group I) - 20

Control (Group II) - 20

AGE DISTRIBUTION

The average age of patients undergoing gastrointestinal surgeries was 49 in the test group and 44 in the control group . As it is seen , the two pairs jof grlups were almost identical . The age distribution was also similar among the two groups . maximum age of a patient undergoing GIT surgery was in this study and minimum age was

- Patients under age of 30 years 15% in test group , 20% in control group . they account for around 17.5% .
- Patients from age group of 31-40 years was 10 % in test group , 15 % in control group , totally they form 5% of total.
- Patients coming under age group pf 41-50 years was 20% in test group , 35 % in control group and they make 27.5% of population.
- Patients from 51-60 years was 40% in test group , 25% in control group , forming 32.5% of total study group.
- Patients above 60 years was 15% in test group and 1% in control group , together accounting for around 10%.

- There is statistical significance between test and control group regarding age distribution.

GENDER DISTRIBUTION

The sex distribution of patients undergoing GIT surgeries are almost seen in this study . The female patients in this study were 35% in test group and 40% in control group , the average female patients were 37.5 % .

The male patients were 65% in test group and 62.5 % in control group .

The average male patients were 62.5 % in this study.

There is no statistical significance among gender distribution.

LENGTH OF HOSPITAL STAY

- The average length of hospital stay for test group patients were 7 days.
- The average length of hospital stay for control group patients were 14 days.
- There is statistical significant difference between test & control group regarding length of hospital stay.
- The length of hospital stay for test group patients were very low compared to control group.

COMPARISON OF COMPLICATIONS

In this study , patients with nil complications were 30 , accounting for 75 % of total patients of which 16 patients were in test group and 14 patients in control group . patients with nil complications accounts for about 80% and 70% in control group 3 patients in test group accounting for 6% of total patients and 2 patients in control group accounting for 15% of total patients developed surgical site infections.

The test group with SSI form about 15% of population and 15% in control group

Number of patients in test group who developed anastomatic leak were 0 and 1 patient accounting for 2.5% of total patients had anastomotic leak The test group population formed 0% of a nastomotic leak , control group patient formed around 1% of anastomotic leak.

Number of patient in test group who had enterocutaneous fistula was 0 & 2 patient in control group accounting for about 5% of total patients Patients who developed enterocutaneous fistula were 0% in test group and 2% in control group . they account for about 5% of total population.

Anastomotic leak occurred in 1 patients which is 5% of control population.

Enterocutaneous fistula occurred in 2 patients which is 10% of control population

SSI occurs in 15% of test and control population . there is no difference in occurrence of SSI between test and control population.

CONCLUSION

From this study , ERAS is beneficial in reducing the length of hospital stay, cost effective with very fewer complications when compared with the conventional management of patient undergoing gastrointestinal surgeries.

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Master Charts:

S. NO	NAME	AGE/ SEX	DIAGNOSIS	PROCEDURE DONE	PRE-OP		PERI-OP				POST-OP				
					Counselling	Mechanical Bowel Preparation	Carbohydrate Loading	Antibiotic Prophylaxis	DVT Prophylaxis	Epidural Analgesia	Mobilisation	RT Removal Liquid Diet	Soft Diet	SSI/ Leak Other/ Complications	LOHS
1	Venugopal	38/M	Post Ileostomy	Take Down	No	Yes	No	Yes	Yes	No	POD 2	POD 5	POD 8	SSI	16
2	Sumathi	48/F	CA caecum	R. Hemicolectomy	No	Yes	No	Yes	Yes	No	POD 2	POD 5	POD 8	Nil	12
3	Lakshmi	49/F	CA-Anorectum	APR	No	Yes	No	Yes	Yes	No	POD 2	POD 2	POD 3	EC Fistula	18
4	Anitha	16/F	Goo	Posterior GJ	No	Yes	No	Yes	Yes	No	POD 2	POD 5	POD 8	Nil	10
5	Ramathai	52/F	CA-Descending	L. Hemicolectomy	No	Yes	No	Yes	Yes	No	POD 2	POD 5	POD 9	Nil	14
6	Jeevan	40/M	Post Sigmoidostomy	Take Down	No	Yes	No	Yes	Yes	No	POD 2	POD 5	POD 8	Anas Leak/ Fistula	20
7	Palaniyammal	55/F	CA Stomach	Gastrectomy	No	Yes	No	Yes	Yes	No	POD 2	POD 5	POD 9	Nil	16
8	Arumugam	48/M	Goo	GJ	No	Yes	No	Yes	Yes	No	POD 2	POD 5	POD 8	Nil	13
9	Gowri	50/F	CA-Anorectum	APR	No	Yes	No	Yes	Yes	No	POD 2	POD 2	POD 3	Nil	12
10	Periyasamy	41/M	CA-Ascending Colon	R. Hemicolectomy	No	Yes	No	Yes	Yes	No	POD 2	POD 5	POD 8	Nil	15
11	Ehumalai	42/M	Post Sigmoidostomy	Take Down	No	Yes	No	Yes	Yes	No	POD 2	POD 5	POD 8	SSI	17
12	Tamilarasan	75/M	CA Stomach	Palliative GJ	No	Yes	No	Yes	Yes	No	POD 2	POD 5	POD 8	Nil	14
13	Krishnan	50/M	Goo	TV with GJ	No	Yes	No	Yes	Yes	No	POD 2	POD 5	POD 9	Nil	14
14	Muniyamma	52/F	Post Ileostomy	Take Down	No	Yes	No	Yes	Yes	No	POD 2	POD 5	POD 8	SSI	18
15	Lakshmi	30/F	GIST-Stomach	Gastrectomy	No	Yes	No	Yes	Yes	No	POD 2	POD 5	POD 8	Nil	14
16	Prakash	40/M	Post Sigmoidostomy	Take Down	No	Yes	No	Yes	Yes	No	POD 2	POD 5	POD 8	Nil	12
17	Muthu	55/M	CA Sigmoid	Sigmoidectomy	No	Yes	No	Yes	Yes	No	POD 2	POD 5	POD 8	EC Fistula	19
18	Raja	53/M	CA Stomach	Gastrectomy	No	Yes	No	Yes	Yes	No	POD 2	POD 5	POD 8	Nil	12
19	Nagaraj	26/M	Post Ileostomy	Take Down	No	Yes	No	Yes	Yes	No	POD 2	POD 5	POD 8	Nil	12
20	Sivakumar	28/M	CA-Anorectum	APR	No	Yes	No	Yes	Yes	No	POD 2	POD 2	POD 3	Nil	10

S. NO	NAME	AGE/ SEX	DIAGNOSIS	PROCEDURE DONE	PRE-OP		PERI-OP				POST-OP				
					Counselling	Mechanical Bowel Preparation	Carbohydrate Loading	Antibiotic Prophylaxis	DVT Prophylaxis	Epidural Analgesia	Mobilisation	RT Removal Liquid	Soft Diet	SSI/ Leak Other/ Complication	LOHS
1	Dharmendra	28/M	CA-Anorectum	APR	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	Nil	5
2	Sudhakar	47/M	CA-Stomach	Gastrectomy	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	Nil	5
3	Shakila	45/F	Cystadenoma pancreas	Distal Pancreatectomy	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	Nil	6
4	Pavithra	29/F	Post Loop Ileostomy	Ileostomy Take Down	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	SSI	5
5	Dilli	40/M	Carcinoid-Distal Ileum	Right Hemicolectomy	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	Nil	7
6	Selvam	62/M	CA-Anorectum	APR	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	Nil	8
7	Malliga	55/F	CA-Ascending Colon	Right Hemicolectomy	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	Nil	5
8	Venkatesan	54/M	Goo	TV with Anterior GJ	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	Nil	4
9	Sumathi	60/F	Distal Cholangio-CA	Whipple's	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	Nil	9
10	Munusamy	45/M	Goo-Post Acid Ingestion	Posterior GJ	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	Nil	6
11	Sarasu	40/F	Retroperitoneal Mass	Exploration	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	SSI	11
12	Rajamanickam	53/M	CA Head of Pancreas	Whipple's	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	Leak	15
13	Nagaraj	26/M	Post Sigmoidostomy status	Take Down	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	SSI	9
14	Latha	60/F	status	Ileostomy Take Down	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	Nil	6
15	Mohan	51/M	Jejunal GIST	Res/Anastomosis	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	Nil	5
16	Sarasu	48/F	CA-Descending Colon	Left Hemicolectomy	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	Nil	6
17	Ponnusamy	62/M	Periampullary CA	Whipple's	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	Nil	6
18	Xavier	60/M	Post Jejunostomy status	Take Down	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	Nil	5
19	Narayanasamy	56/M	Post Ileostomy status	Take Down	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	Nil	5
20	Aathikesavan	65/M	CA-Stomach	Gastrectomy	Yes	No	Yes	Yes	Yes	Yes	DOS	POD	POD	Nil	6